15/11/28

Vol. XXVI. Part 10.

[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

The Journal of the Department of Agriculture of Victoria, Australia.

October, 1928.

PRINCIPAL CONTENTS

Madeira

Manuring Washington Navel Oranges

Irrigation Methods

Cold Storage of Apples

Control of Plant Insect Pests

Pig Feeding Experiments

PRICE THREEPENCE. (Annual Subscription—Victoria, Interstate, and N.Z., 3/- ; British and Foreign, 5/-).

BRUNNING'S–

Head-quarters for

QUALITY Farm Seeds

"Whatsoever a man soweth, that shall he also reap." Only one thing can grow well in soil at the one time. Either weeds or a good crop will prevail. It is for you to determine what the result shall be. Do your utmost to ensure that your result shall be a good crop by using BRUNNING'S "INCOMPARABLE" SEEDS.

"Standard" Quality
JAPANESE MILLET

The Summer Fodder "par excellence" ranks with Sudan Grass as the leading Annual Summer Fodder, and is the best of all the millets for Victorian conditions. Comes in early, and can be fed off in from 5 to 6 weeks after seeding, or cut and made into hay.

Genuine "Garawi"
SUDAN GRASS

The true original strain of the highest purity and germination. Will give three to four cuttings, and is extremely drought-resistant. The best of all the Summer Hay Plants.

Hunter River
LUCERNE

It is absolutely dodder-free, and is of the True Giant, Upright Broad-leaved, Purple-flowered type. Available in three qualities —"Standard" Quality, "Supergrade," Choice Quality.

SWEET or BOKHARA CLOVER

Will thrive on almost any kind of land, and grows luxuriantly in many waste places. Can be pastured, cut for green feed, made into hay, or first class ensilage, and is the greatest soil-improving plant ever introduced. Valuable for early spring fodder and absolutely drought-resistant.

Further Particulars and Quotations, Post Free

BRUNNINGS

F. H. BRUNNING Pty. Ltd.

57 Elizabeth St., MELBOURNE

C. 1

THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

CONTENTS.—OCTOBER, 1928.

		PAGE
Madeira	*F. de Castella*	577
Manuring Washington Navel Oranges	*J. L. Provan*	588
Salt Feeds and Milk Production		593
Irrigation Methods	*L. C. Bartels, B.Agr.Sc.*	594
Top-dressing Lucerne—Results of Experiments		598
Control of Plant Insect Pests	*C. French, jun., F.E.S.*	601
Maize Experiments at Orbost	*P. Ryan, B.Agr.Sc.*	605
Pig Breeding in Denmark		608
Cool Storage of Apples—Report on samples exhibited at Government Pavilion, Royal Show, 1928	*E. Meeking*	609
Vegetable Preservation	*Miss M. Knight*	617
Stallion Register, 1928–29—Part 2		620
Pig Feeding Experiments	*A. J. Gill*	624
Farrowing Pen		628
Pig Feeding Experiments in Great Britain		629
Australian Butter and Cheese Exports, 1927–28		631
Tuberculosis in Cattle in U.S.A.		632
Swedish "Eat More Fruit" Advertising Campaign		633
Why Pack Good Apples in Weather-beaten Boxes?		634
Prickly Pear—A Hardy Specimen		635
Orchard and Garden Notes	*E. E. Pescott, F.L.S.*	636
Reminders for November		638

COPYRIGHT PROVISIONS AND SUBSCRIPTION RATES.

The Articles in the Journal of the Department of Agriculture of Victoria are protected by the provisions of the Copyright Act. Proprietors of newspapers wishing to republish any matter are at liberty to do so, *provided the Journal and author are both acknowledged.*

The Journal is issued monthly. The subscription, which is payable in advance and includes postage, is 3s. per annum for the Commonwealth and New Zealand, and 5s. for the United Kingdom and Foreign Countries. Single copy, Threepence.

Subscriptions should be forwarded to the Director of Agriculture, Melbourne. A complete list of the various publications issued by the Department of Agriculture will be supplied by the latter.

Cyclone

METAL GATES and FENCES

Cyclone Red Tag Quality Fence and Products — Cyclone Fence & Gate Co. Pty. Ltd.

The Red Tag Trade Mark is your guarantee. Look out for it!

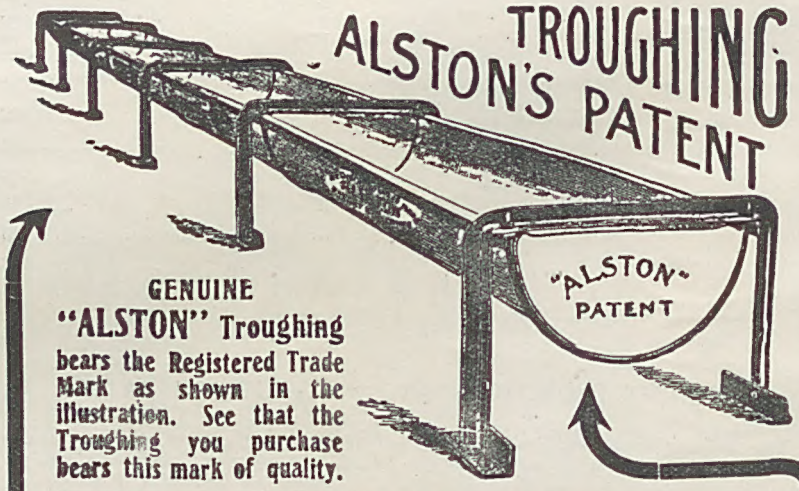
ON economy alone you should decide on Cyclone fences and gates. Cheaper to erect than an ordinary wire fence, Cyclone is far more durable than any other type. Being made of galvanized wire throughout, Cyclone fences are unaffected by either weather or age.

Cyclone gates, too, are everlasting. Ask for prices and details—we will send you post free one of our beautifully illustrated catalogues. Let us know your requirements and we will quote a price.

CYCLONE FENCE & GATE Co. Pty. Ltd.

189-191 WILLIAM STREET —— MELBOURNE
and at Sydney and Adelaide

ALSTON'S PATENT TROUGHING



GENUINE "ALSTON" Troughing bears the Registered Trade Mark as shown in the illustration. See that the Troughing you purchase bears this mark of quality.

Steel throughout. Put together with a wrench, no solder required. Cannot leak or pull apart because the Alston Patent Coupling makes a perfectly watertight joint without grooves to fracture the galvanising, while locking every section together as rigidly as a bridge.

The heavy Steel Angle Frame and heavily Galvanised Steel Sheets used, together with our Patent Coupling are points which make the ALSTON TROUGHING superior to all others.

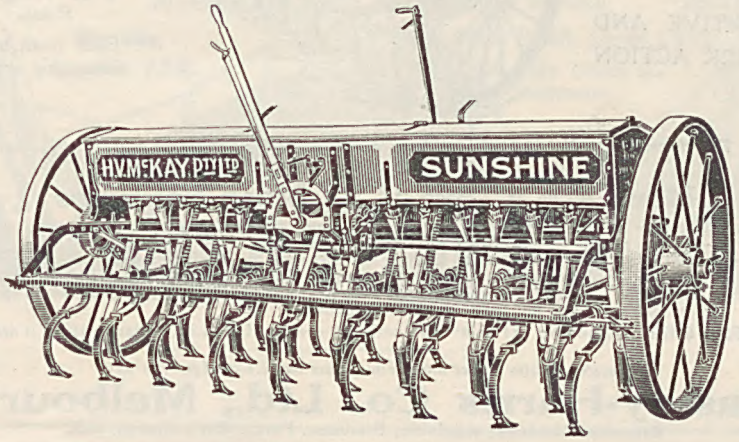
Send for Illustrated Leaflet.

JAMES ALSTON & SONS PTY. LTD., Queens Bridge, Melbourne.

Postal District 6.

THE "SUNTYNE"

Combined Grain and Fertilizer Drill and Spring Tyne Cultivator



AS A CULTIVATOR the "SUNTYNE" cuts out all the weeds, and by reason of the fact that the points lie flat in the ground and all four rows cultivate to an absolutely uniform depth, a perfectly consolidated seed bed results.

AS A DRILL the "SUNTYNE" deposits seed and fertilizer on the compacted seed bed and covers it with a mulch of finely pulverised soil, thus ensuring full benefit from moisture stored in the ground, and an early germination.

Because of these facts the great bulk of Australia's Annual Crop of Golden Grain is sown by the

"SUNTYNE" CULTIVATOR DRILL

Manufactured in sizes from 17 tynes, sowing 8 rows covering 5 feet, to 47 tynes, sowing 24 rows covering 14 feet.

PRICES LOW. SPECIAL TERMS AVAILABLE.

Write for Particulars.

H. V. McKAY PTY. LTD.

Sunshine Harvester Works, Sunshine

Showrooms - - - 664 Bourke Street West, MELBOURNE

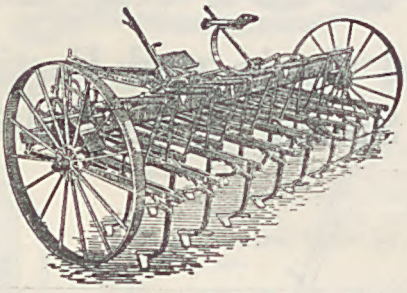
MASSEY-HARRIS

No. 15 STIFF-TOOTH CULTIVATOR

WITH FAMOUS POWER LIFT

□

POSITIVE AND QUICK ACTION



Syphon Oiler for Axles.

Oscillating Forecarriage.

Wide Range of Points.

Each tooth has a safety trip spring.

The Massey-Harris No. 15 Stiff-Tooth Cultivator is the ideal Implement for working up Fallow, and is also a great Weed Killer.

Here are a few of its Main Features:

Strong and Heavy Frame.—Sturdy and rigid, giving it powerful resistance to strains, and a tremendous capacity for hard and heavy work.

Pressure Applied through Lift.—The pressure is applied through the lift, and is regulated by convenient lever. Adjustable pressure provides for deep or shallow cultivation.

Sure Acting, Two-Wheel Driven Power Lift.—Quick and positive in action, raising and lowering the teeth in a few seconds.

SIZES: 8 feet—11 teeth; 11 feet—15 teeth. Power or Hand Lift. Tractor Hitch if desired.

Catalogue, also Prices and Terms, from our Local Agent, or write

Massey-Harris Co. Ltd., Melbourne

Branches: Sydney, Adelaide, Brisbane, Perth, Christchurch, N.Z.

LYSAGHT'S

ORB

CORRUGATED ROOFING IRON

Obtainable from all leading Storekeepers and Timber Merchants.

This well-known brand has held an established reputation for more than 70 years, and is the recognized standard for Quality in a perfectly galvanized sheet.

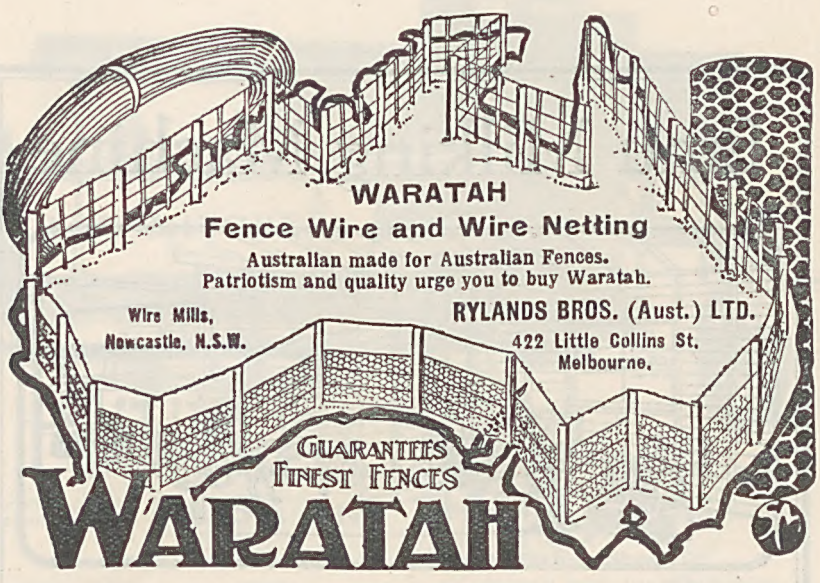
The "Banyule" Jersey Stud

HEIDELBERG, VICTORIA — 8 miles from G.P.O.

ALL GOVERNMENT TESTED

YOUNG STOCK FOR SALE

Inspection and Correspondence Welcomed. **C. GORDON LYON**



DEPARTMENT OF AGRICULTURE, VICTORIA

NOW AVAILABLE

Handbook of Potato Diseases in Australia—and their Treatment

By D. McALPINE,
GOVERNMENT VEGETABLE PATHOLOGIST

With Appendices by
W. Laidlaw, B.Sc. (Biologist), on **Eel Worms;**
and
C. French, Jnr. (Government Entomologist), on
Insect Pests of the Potato.

235 Pages (Cloth). 58 Full Plates. 176 Illustrations. **Price, 5/-** Postage: Commonwealth, 2d.; New Zealand, 8d.; British and Foreign, 1/4.

Applications accompanied by Postal Note or Cheque, covering Price and Postage, to be forwarded to **The Director** of Agriculture, Melbourne, Victoria. Remittances from beyond the Commonwealth to be made by Post Office Order.

SCIENTIFICALLY FITTED GLASSES ENSURE COMFORT

IF you are in doubt as to whether you require glasses or not you should have your eyes tested by an expert. The Optical Service our Clients enjoy ensures comfort in wearing glasses that fit accurately.

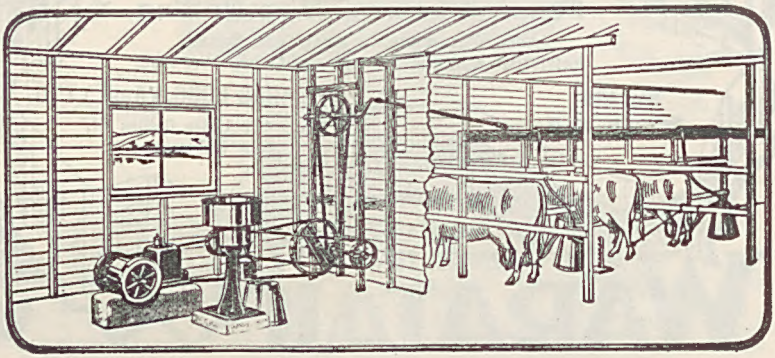
'Phone 6778 for an appointment

E. WOOD PTY. LTD. 95 ELIZABETH STREET — MELBOURNE —

OPHTHALMIC OPTICIANS

Stevenson

Emu Milking Machine



It's Simpler, Safer, Better and only Half the Price.

Old Style Milker, 4 units, about -	£248	10	0
EMU Milker, 4 units, - - (Engine and all Fittings)	£124	5	0
Difference -	£124	5	0

THE EMU Bucket System Milker keeps a daily check on every cow in the herd and the extra bucket supplied free makers the work easy for youngsters. The EMU Bucket System is more sanitary and the milk of the lowest bacterial count insuring highest returns. Takes but a fraction of the usual time to clean; easier on the cow, cleaner than hand milking, and increases production. Every plant guaranteed.

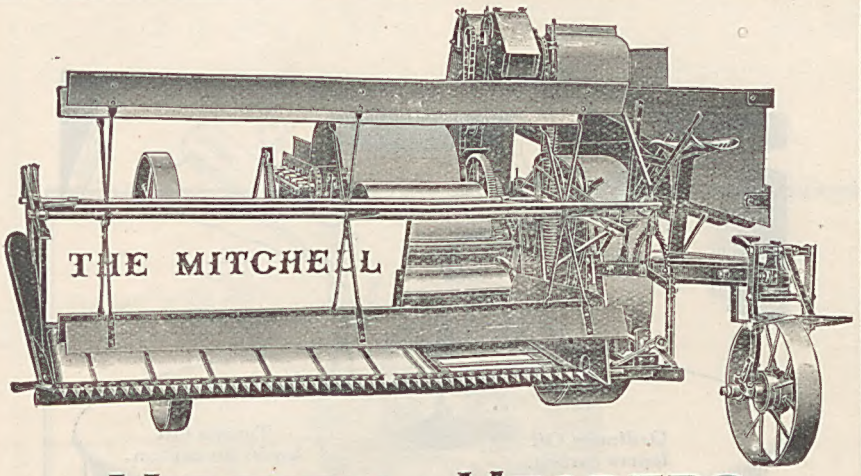
Hundreds in use.

Write for all information — no obligation.

T. Robinson & Company Pty. Ltd.

SPOTSWOOD, VIC. Showrooms: 536-538 Bourke St., Melbourne

Sydney Office and Depot: RAILWAY PARADE, BURWOOD



MITCHELL HEADERS

For all crops, but specially good in **MUSK AND THISTLES** It will pay you to get particulars

Everything for Farm, Orchard, Dairy, Sheep

EASY TERMS. *WRITE.* *PLEASE MENTION THIS ADVERTISEMENT.*

MITCHELL

AND CO. PTY. LTD.

Head Office: West Footscray.
Showroom: 596 Bourke St., Melb.
N.S.W. Head-quarters: Parkes.

"DERVAL" (Non-Poisonous) Paste Sheep Dip

This is what one enthusiastic user writes:—

"Iluka,"
MOOLAP, Victoria.

MESSRS. A. VICTOR LEGGO & CO.,
218-222 Queen Street,
MELBOURNE.

Dear Sirs,

I have used your Dip "DERVAL" for the last three years with absolute satisfaction. It is the only Dip that I have used that has kept the sheep entirely free from tick for three years. The quality of "DERVAL" is also reflected in the bright and clean condition of the wool at shearing.

Yours faithfully,
(Signed) S. J. LUGG.

PRICE: { Drums, sufficient to make 200 gallons of Dip .. 20/- per drum.
" " " 1,000 " " .. 90/- " "

"VALLO" Dips (the Cheapest and Best)—

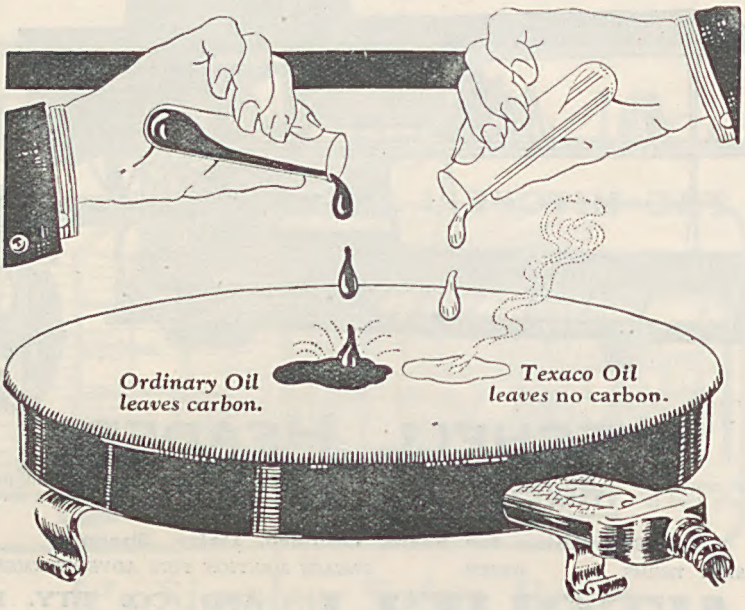
"VALLO" Sheep Dip Powder (Arsenical)—Cases, 10 x 10 lb. packets .. 72/6 per case
"VALLO" Sheep Dip Liquid (Non-Poisonous)—Drums, 5 gallons .. 35/- per drum
Tins, 1 gallon .. .. 7/6 per tin

Build Up Your Stock

"VIGOREEN" (Concentrated) for Sheep—Bags, 112 lbs. .. £30 per ton
"VIGOREEN" (for Sheep) Mixed Ready for Use—Bags (12 to ton) £15 " "
DAIRY VIGOREEN—Bags, 112 lbs. .. £25 " "
PIG VIGOREEN—Bags, 112 lbs. .. £22/10/- " "

Please Note.—Vigoreen is the only product sold and f.o.r. any rail station throughout Victoria and Riverina; all other prices are net f.o.r. Melbourne.

A. VICTOR LEGGO & CO. - 218 Queen St., Melbourne
(Manufacturers) **Agents All States**



It's easy to claim—but *TEXACO* proves *its freedom from Hard Carbon*

CALL at any Texas Company Office and see the Hot Plate Test. A few drops of oil allowed to fall upon an electric Hot Plate and instantly burned up. If its ordinary oil, it leaves a blot of carbon but if its Texaco, it leaves no carbon at all.

Use clean clear golden Texaco----the only oil that will give your engine a long and healthy life.

TEXACO

CLEAN-CLEAR-GOLDEN

MOTOR OIL

1A-FP-28

SUPPOSING Fertilisers weren't needed . . . . . what a lot of money would be saved. Under PRACTICAL conditions a lot of money would be lost if only one of those fleeting temptations to make a cut in the fertiliser bill were obeyed.

NITROGEN, once thought of little consequence in Australian agriculture, is now recognised as an important element of plant food, though there is still a lot of money being lost because the value of Nitrogen is not more widely appreciated.

Use more Nitrogen. Ask your fertiliser agent about SULPHATE OF AMMONIA. That's Nitrogen in its ideal form . . . . . obtainable now in a "neutral" condition—dry, non-caking, and free-running.

Literature from

THE METROPOLITAN GAS COMPANY,
196 Flinders Street, Melbourne.
Telephone: Central 8162.

SA 1/28

NATIONAL TRUSTEES

Executors & Agency Company of Australasia Ltd.

DIRECTORS :

EDWARD FITZGERALD, Esq., LL.D., Chairman.
Senator Major-General H. E. ELLIOTT, C.B., C.M.G., D.S.O., D.C.M.
JOHN I. WINTER-IRVING, Esq. CHAS. R. MURPHY, Esq.
JOHN S. FEEHAN, Esq. EDWARD RYAN, Esq., M.B. et Ch.B.

This Company Acts as Executor or Joint Executor of Wills, Administrator, Trustee of Settlements, and Agent for Absentees under Power of Attorney.

MONEY TO LEND ON BROAD ACRES AND FARM LANDS

Offices—113 Queen St. (Corner of Little Collins St.), Melbourne

CHAS. CROMIE, Manager.

is a simple arrangement that multiplies the power at the handle 260 times—handy to use, easy to move, quickly rigged, and works in roughest country. Standard equipment pulls trees and stumps from 1½ acres without changing anchor. Many other time and labour saving features. Catalogue with pleasure.

TREWHELLA BROS. Pty. Ltd., TRENTHAM

"SEVERAL OTHER OWNERS ENQUIRED WHAT DIP I USED"!

Taking a tip from a friend, a Victorian grazier used "Sickle Brand" Powder Sheep Dip with the following satisfactory results. To quote his own words :—

> "I shore at a community shed with several other owners, amongst whom several brands of Dip were represented. Sheep were mostly in poor condition at shearing on account of the bad season, and all sheep were infested with tick, some very badly, until they came to mine (the last in the shed), which were absolutely clean and free from tick. Several of the other owners have enquired what Dip I used, and have expressed their intention of using your Dip in future. I also found that your Dip is very easy to mix, and is easily stirred in the bath after standing."

Profit by this example. Save time and trouble! Use "Sickle Brand" Powder Dip!

SICKLE BRAND POWDER SHEEP-DIP

CUMING SMITH & CO. PTY. LTD.

65 WILLIAM STREET — [G.P.O. Box 390] — MELBOURNE

New Booklet containing many points of interest to graziers is available free on application.

UNEQUALLED!!

Lewis & Whitty's
"D" Sunproof Oil

has stood the test of time, and is still the superior heavy-bodied stringy oil that is sought by Agriculturists.

"D" Sunproof Oil
is guaranteed to maintain its lubricating properties under extreme conditions of heat.

Manufactured to Lewis & Whitty's formula by

NEPTUNE OIL COY. LTD.
RICHMOND, VICTORIA
Also Sydney, Brisbane, Adelaide, Fremantle, Hobart & Launceston

BRUNNING BEST FOR BEARING FRUIT TREES

(True to Name and Healthy)

ARE PLANTED THROUGHOUT AUSTRALASIA

Shipments made to all Parts of the World

JOHN BRUNNING & SONS
Established 60 Years

SOMERVILLE NURSERIES,
SOMERVILLE,
VICTORIA — AUSTRALIA

REGISTERED TRADE MARK

Works—
CURDIE'S RIVER

Telephone—Central 2807

"BULLDOG" Unburnt (Ground Carbonate) Agricultural Lime

For Orchards, Crops, and Pastures

Its use is strongly recommended by all experts, and those who have had practical experience. Any quantity supplied at shortest notice.

For applying to land we recommend our "Ajax" Lime Spreader

Also Builders' Lime, all brands Cements, and Builders' Hardware

Rates and full particulars from Distributors—

T. CURPHEY Pty. Ltd. 225 Coppin St. Richmond, Victoria

'PHONE 7419 CENTRAL

.. THE ..

Australasian Mutual Insurance Society

LIMITED

(Now Incorporated in the Australian Alliance Assurance Company.)

400-2 COLLINS STREET, MELBOURNE

LIVE STOCK INSURED

At Lowest Current Rates obtainable in Australia.

OTHER DEPARTMENTS OF BUSINESS

Fire, Marine, Fidelity Guarantee, Plate Glass, Personal Accident and Sickness, Employers' Liability, Workmen's Compensation, Public Risk, Motor Car, and Burglary.

INSURE WITH THIS SOCIETY, AND RECOMMEND IT TO YOUR NEIGHBOURS

This Summer—Visit New Zealand!

THIS SUMMER—have a worth-while holiday. Visit New Zealand. It offers a variety of scenic attractions, beautiful snow-capped mountains, clear crystal streams, green forests, glittering lakes, sparkling waterfalls, wonderful thermal sights—it is an ideal holiday land in Summer.

VISITS to Government Agricultural Institutions and Experimental Farms can be provided for and all the details of your travel by rail, steamers and motors in the Dominion arranged at the New Zealand Government Offices in Melbourne. There is no extra charge for this booking service and it will add materially to the enjoyment of your trip.

For illustrated booklets and information regarding fares, routes, &c., apply

NEW ZEALAND GOVERNMENT OFFICES,
59 WILLIAM STREET, MELBOURNE, C.1

HAY-STACK COVERS

300 Tons of Hay Covered with 3-Star Covers, Glen Tree Estate, Moriac.

For covering Hay-stacks, Onions, Wheat, Wool, Lucerne, and for general use as a Tarpaulin. We also manufacture Duck Tarpaulins, Verandah and Window Blinds, Tents, Car Covers, and all Canvas Goods. Please write for full price list.

Prices of a few stock sizes.

Sizes in ft.	3-star.	4-star.
12 x 20	£2 3 0	£3 1 6
12 x 24	2 13 6	3 15 0
18 x 20	3 8 6	4 11 0
18 x 24	4 2 6	5 9 0
18 x 27	4 12 6	6 3 0
21 x 30	5 17 6	7 17 6
22 x 24	5 7 0	6 14 6

Ropes, if required, 3/6 cover, except 22 x 24 ft. Any size made to order.

WYETT MANUFACTURING CO. Pty. Ltd.
21-23 Bellarine Street, Geelong, Victoria. 'Phone, 1688

This Journal

offers exceptional advantages

for Advertising

Circulates throughout the **Country Districts** of **Victoria** and amongst **Farmers** of the **Commonwealth**, reaching also country professional men, tradesmen, schoolmasters, teachers, and the like.

Exceptionally satisfactory results have followed the advertising of Stud Stock in this Journal.

Rates on application to the Official Canvasser

Mrs. Hemming, "1 Cobham," Ruskin St., Elwood, S.3

Australian "ESA" Bluestone

Approximate Analysis 99·15% Copper Sulphate.

FOR SPRAYING, PICKLING, BATTERY PURPOSES, ETC.

If your Storekeeper has no Stocks, Send your Inquiries to:—

ELDER, SMITH & CO., LIMITED, SOLE AGENTS

ADELAIDE: 27-31 Currie Street.
MELBOURNE: 95-97 William Street.
SYDNEY: 4 Bridge Street.
BRISBANE: 334-338 Queen Street.
PERTH: St. George's Terrace.

WRITE FOR DESCRIPTIVE PAMPHLET

The Best
IS
The Cheapest.

LYSAGHT'S AUSTRALIAN MADE

WIRE NETTING, FENCING AND OTHER WIRES, ZINC OXIDE

are known as the Very Best throughout Australia

Obtainable from all Leading Merchants and Storekeepers

LYSAGHT BROS. & CO. LTD.

Head Office—39 Pitt Street, SYDNEY
Works—Parramatta River

Agents for Victoria
GIBBS, BRIGHT & CO.

COCKBILL'S
BONE MEAL for FEEDING
CATTLE, PIGS, and all FARM STOCK

IS A SOURCE OF LIME, PHOSPHATES, AND PROTEIN.

Most Fodders are deficient in mineral matter——
BONE MEAL will provide the necessary mineral matter.

COCKBILL'S BONE MEAL is manufactured from clean, fresh bones, steamed and sterilized at a high temperature and pressure, and finely ground to ensure easy digestion. Price, 16s. per cwt.

Sample on request to J. COCKBILL, 407 POST OFFICE PLACE, MELBOURNE.

The "Fulham Park" Ayrshire Stud
ROCKBANK, VICTORIA (20 MILES FROM G.P.O.)
Topped Ayrshire Herd, 1927
All Government Tested YOUNG BULLS FOR SALE

The "Fulham Park" Stud of Peerless Black Leghorns
The best (by test) this side of the Line.
EGGS AND STOCK FOR SALE

Inspection and correspondence welcomed. J. COCKBILL, 407 P.O. Place, Melbourne, Victoria.

Cross Proves Superior in Efficiency and Economy

PARKDALE,
BOGAN GATE, N.S.W.
31st January, 1928.

"I have been a 15/30 McCormick Deering tractor owner for many years, and I have subjected each and every fuel and oil to proper tests in order to gain the knowledge as to which gave me the greatest satisfaction from an all round point of view, the principal factors of which being engine efficiency with greatest economy of running. Cross Kerosene has proved itself superior in every way and seems to maintain its standard quality always, never varying as other fuels seem to do. Suffice it to relate that I can get more work per gallon from Cross than is possible with other fuels."

(Sgd.) A. W. HILL.

CROSS

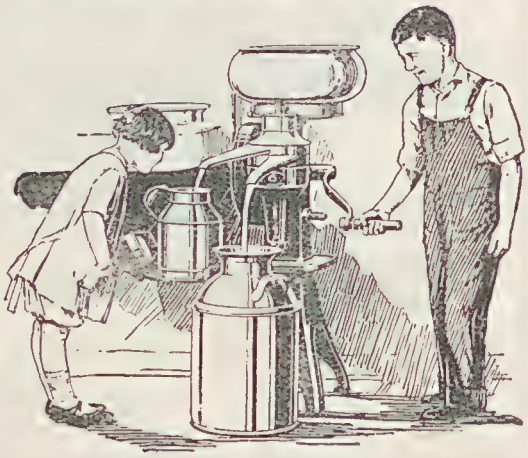
POWER KEROSENE

CK 175

The Pride of the Household—
The New McCORMICK-DEERING

CAPACITIES
35 to 150
gallons of milk
per hour.

Hand, Belted
or Electric.



EASY to turn—easy to clean—attractive, efficient and well-designed, the New McCormick-Deering Ball-Bearing Cream Separator might well be called The Pride of the Household. Its beautiful black-japanned surface—its graceful lines—its handsome appearance, all combine to make the New McCormick-Deering Ball-Bearing Cream Separator a machine you will be proud to show to your friends. When you consider these points—when you consider, too, that it has high-class ball-bearings at all high-speed points—that it skims close—that it is automatically lubricated—you will agree that for real, solid value the New McCormick-Deering Ball-Bearing Cream Separator stands alone. The McCormick-Deering local agent will gladly give you full particulars. Call and see him, or write us direct for our attractive illustrated catalogue.

INTERNATIONAL HARVESTER COMPANY
OF AUSTRALIA PTY. LTD.

278-294 Roma St.
BRISBANE

543-555 Bourke St.
MELBOURNE, C.1

RICHARD PURSER & CO.,
BASSENDEAN,
AGENTS FOR W.A.

ROBT. NETTLEFOLD PTY. LTD.,
HOBART,
AGENTS FOR TAS.

229-231 Castlereagh St.
SYDNEY

113-114 North Terrace
ADELAIDE

THE JOURNAL

OF THE

Department of Agriculture

OF

VICTORIA.

Vol. XXVI. October, 1928. Part 10

MADEIRA.*

By F. de Castella, Government Viticulturist.

Portugal has indeed been favoured by Bacchus: she produces two of the world's most renowned wines. Concerning Port, I had the privilege of contributing a paper to the Rutherglen Wine Congress in 1925. Madeira, her second œnological jewel, I have selected as the subject of my present paper. To do so seems opportune, not only on account of the excellence of the wine and the interest attaching to the curious method by which it is reared, but also because it is so little known and understood in Australia. We are consistently unfortunate in the application of this old-world name to many of our wines. The word Madeira would seem, in the opinion of some of our bottlers, to be synonymous with "any other sort of sweet white wine." It is often misapplied to wines which in no essential particular recall the very special product for which the "Island of the Blessed" has achieved world-wide fame.

The wines of Madeira constitute a group quite distinct from anything else, in which oxidation plays a most important part—wines that at one time enjoyed remarkable popularity in England among a circle of consumers who certainly knew and appreciated good wine. Among the many types this great Commonwealth of ours can, and no doubt will evolve, there should be place for a wine of this class, not necessarily a servile imitation of Madeira, but, like it, an oxidized wine. I hope, therefore, that a description of this celebrated wine, and the means by which oxidation is promoted and hastened, may prove of interest to this Congress. Some of our wines have, at least, a family likeness with Madeira. The almost dry Verdelhos and Pedros, conspicuous at Bendigo Shows before phylloxera, distinctly recalled it. If similarly handled, the likeness would have been greater. Some of

* Paper read at the Ninth Interstate Wine Congress, Rutherglen, October, 1928.

our Australian Sherries are really more like Madeira than Sherry, though this may be unsuspected by the owner, to whom a high-grade Madeira is an unknown quantity.

Madeira has long been a household word. Far more so than its present trade importance would seem to justify. We still have Madeira cake, though the wine it is called after and supposed to contain is but little known to us to-day. In the story of its rise to fame and subsequent decline we have an object-lesson which we can profitably take to heart. It is the old story of inability to maintain the supply of high-grade wine on which the earlier reputation was built up. Price-cutting, and the reduction in quality it results in, have at one time or other caused crises in most wine industries. The Port trade had a similar experience over a century ago. Though it has long since recovered, the process was slow and painful. If Madeira has not yet done so, it is for reasons quite other than lack of quality in the wine. It should be possible to again arouse interest in this remarkable product, or perhaps in one of similar type evolved on our own country: a potential field worth the attention of our vinegrowers.

Geographical and Historical.

Situate in the Atlantic, just above the thirty-second degree of North latitude, some 600 miles west-south-west of Gibraltar and 300 miles north of the Canaries, is a small group of volcanic islands—Madeira, Porto Santo, and the three Desertas. The first is by far the largest, having an area of 316 square miles and a population of 150,000. Funchal, the capital and centre of the wine trade, is a town of 30,000 inhabitants. Colonized in 1421 by the Infante don Henrique of Portugal, it was not long before vines were planted, and they thrived remarkably in the mild climate to which the island owes its wide reputation as a health resort.

Madeira is a Portuguese word meaning wood. The name originated from the dense forests that existed when the island was discovered. Burning off by the early settlers resulted in bush fires that soon cleared the whole island. Though the latitude corresponds to that of Newcastle, in the Southern Hemisphere, the climate is even milder. Bananas and custard apples thrive, whilst sugar-cane is grown commercially. Madeira is one of the rare examples of a wine of exceptional quality, produced under almost tropical conditions. It is a further exception to rule, in being one of the few really choice wines grown on volcanic soil.

It is a wine that has for centuries been held in high esteem in the navy. The frequent calls made by war-ships afforded opportunities for the direct purchase of the choicest growths. Thus did the wine become known in England, which for many years was its best customer. English merchants established themselves at Funchal, with the result that, for a couple of centuries, the wine trade has been almost exclusively in English hands. At the commencement of the 19th century this was very prosperous, exports reaching a million and a half gallons, of which England imported 447,800 gallons in 1801. The popularity of the wine in England was increasing, however, as no less than 736,000

gallons were imported in 1819, this being the record year. In pre-oidium days, the forties of last century, the average vintage was in the neighbourhood of two million gallons a year. Since then, production and export show a considerable falling off. At the close of last century the average vintage had declined to about 600,000 gallons, about half a million being exported. In 1891 the exports amounted to 550,000 gallons, France being the best customer with 206,000 as against England's 172,000: other importing countries being Germany (91,000 gallons), Russia, the mainland of Portugal, Brazil, &c. During the past 40 years England's imports have declined steadily; the Board of Trade figures for the three years concluding with 1927 show a yearly average of not quite 60,000 gallons.

Madeira has long enjoyed a great reputation in France. François I. thought highly of it. He and bluff King Hal pledged one another in this wine at the festivities of the Field of the Cloth of Gold in 1520. At the present day, with the exception of Vermouth and some other "Aperitifs," it is the only fortified wine often met with in France, where a small glass of Madeira and a slice of cake is quite the correct thing about 11 a.m. Served after the soup at a dinner, a recent French writer explains how its tonic and appetising virtues help the palate and the stomach—"a tear of golden Madeira," he says, "gives these organs all the necessary activity." Feret's wine dictionary stated, some years ago, that the total shipments to France were not considerable, but that, in revenge, one finds in that country innumerable and, most often, detestable imitations of these precious wines.

Uncle Sam was at one time a good customer. The Pilgrim Fathers seem to have appreciated good wine; more so, indeed, than their present-day descendants. Soon after the establishment of the American Colonies staves and other produce were bartered with the Madeirans for their wine, which was the fashionable beverage in the United States of America a hundred years ago.

The fluctuations of the industry have been varied and curious. Catastrophes of various sorts befel the island. Storms and earthquakes wrought havoc about the middle of the eighteenth century. The worst blow was the appearance of oidium in 1846. In that moist, semi-tropical coastal atmosphere, the fungus proved extraordinarily virulent, and until its control by sulphur was found out, some six years later, the grape crops were almost annihilated. This temporary cessation of production is very generally blamed for the subsequent decline in the consumption of this once favorite wine in England and elsewhere. With failing supplies prices hardened and the public turned to other wines. Fashion is fickle, and Madeira lost a hold on public favour that it has not been able to regain.

Phylloxera appeared in 1873, at which time the best grafting stocks of to-day had not yet been raised. Fortunately, the pest did not spread very rapidly. Re-constitution was slow and difficult in the early stages, but from 1890 onwards large numbers of grafted resistant rootlings were imported from France. Field grafting was also practised, the mild climate being altogether favorable for it.

What is Madeira? Its Several Types.

To attempt to describe in words, the impression a wine creates on the palate is difficult and unsatisfactory, especially in the present case, since Madeira is so different from any other well-known wine.

P. Morton Shand, in his recent book of wine, says of it: "Madeira is, or was, a very dry flame-red or amber-coloured wine, with a highly individual pine-apple flavour." Individual it certainly is, but pine-apple is not too happy a comparison; its indescribable flavour can never be forgotten. It combines a variety of bouquets with a distinct nuttiness through which a curious acidity stands out conspicuously; so much so that, to one unfamiliar with it, the first impression is almost one of unsoundness. But for this queer trait, it might perhaps be assimilated to a brown after-dinner Sherry, which, in spite of marked difference, it does in some ways recall. It is coarser, without being really coarse, than a Sherry of fine type; in other words, it is less ethereal and more pungent; in fact, more like some of our Australian Sherries.

Sherry and Madeira are distant cousins. The latter has no near relation unless it be Canary, grown largely from the same grapes, and in a similar climate, but a good deal its inferior.

Professor Saintsbury devotes a chapter of his "Notes on a Cellar Book" to Sherry and Madeira. Concerning the latter he says "It may seem irreverent to give so famous, and at its best so exquisite, a liquor as Madeira merely a postscript to the notice of its supplanter, which, by the way, it had itself supplanted. . . . I know no wine of its class that can beat Madeira when at its best; the very finest Sherries of the luscious kind . . . cannot touch it." He qualifies this by the fear "that the very best Madeira is and always has been, since the pre-oidium wines were exhausted, mainly a memory. . . Certainly a real old Bual or Sercial of the times before 1850 . . . was a thing to say grace for and remember. In fact, I think Madeira and Burgundy carry combined intensity and complexity of vinous delights further than any other wines. There is possibly something of the unlawful about their rapture, something of the 'too much' and accordingly they are the goutiest of all juices of the grape, whether pure or sophisticated."*

In another chapter he classes it on an equal footing with Port: If Claret is the queen of natural wines, Burgundy is the King: their places being taken in the other realm of the artificial by Madeira and Port."

A leading Portuguese wine authority, Senor Cincinnato da Costa, explains, in the flowery language of his country, how Madeira is a wine that is best served after the soup. Being at the same time tonic and stimulant it is well fitted by its generally dry taste and distinct flavour of its own, reminding one of quinine, to strengthen the stomach and open the appetite. Port, on the other hand, is more suitable for the close of a meal. At dessert, Madeira is not so acceptable as Port, since it is not so velvety, so heady, nor so balsamic. "These two Portuguese wines are equally noble and of inestimable value. They are twin pearls of our oenological casket. Each has its own qualities—its individual role. Each can be considered to be the first among the first. Both are sons of privileged regions such as exist nowhere else in the world: they enjoy on this account universal renown among all known generous wines."

* This term must not be taken to mean adulteration. It refers to the fortification, or addition of grape wine spirit, which is essential in the making of Port, Madeira, &c.

Madeira was formerly a dry wine or at most a slightly fruity wine; sometimes indeed it was almost aggressively dry. There were, it is true, a few exceptions such as the Malmsey Madeira which was always a luscious sweet wine. To-day, the public taste has changed considerably; demanding a wine that is distinctly sweeter than a few years ago.

Though the bulk of the produce of the island is a blended or standardized wine of very definite and unmistakable type, varying somewhat in sweetness, but in other respects more uniform, there are and always have been a good many sub-varieties of Madeira. Though they bear a family resemblance to the type wine, they may present individual differences in certain directions. It is chiefly among the higher-priced wines that these variants are to be found. They are known by different names; sometimes by that of the district of the island where they are grown, such as Cama de Lobos, Campanario, Saõ Martinho, &c.; sometimes by that of the grape from which made, e.g., Malmsey or Malvasia, Boal, Sercial, or Verdelho. Such special wines are either the produce of one season, that is vintage wines, or they may be reared in Soleras, conducted on somewhat similar lines to those that play so important a part in connexion with Sherry. Soleras without "Flor," however, as Madeira is too alcoholic for its growth (saving a few exceptional cases on the north of the Island where the wines are lighter).

Madeira Malmsey must not be confounded with the wine in which the ill-fated Clarence was drowned in 1471: This was a Greek wine which at one time found much favour in England. The Greek Malmsey industry was forced by Turkish oppression to transfer itself to Candia or Crete, whence cuttings were brought to Madeira. Such is supposed to be the origin of the vine from which is made the wine since known as Madeira Malmsey.

We thus have a fairly wide range of different Madeiras, from the light and pale "Rainwater Madeiras" once so popular in the United States, and the somewhat similar wines nicknamed "Muslin Madeira" to powerful pungent wines of brown colour. The Malmsey Madeiras are distinctly sweet, but the others are, or rather were, typically dry wines. That Madeira is essentially a dry wine is evident from numerous analyses of typical wines of vintages from 1840 onwards given by Cincinnato da Costa. Of these only one wine has a gravity of 1 degree Baumé, some indeed are less than 0 degree B. The alcohol strengths vary from 27 per cent. to 41 per cent. proof, but are mainly between 30 per cent. and 35 per cent. The total acidity varies from .47 to .86 (as tartaric).

Maderisation.

We have seen that Madeira is essentially an oxidized wine, and that it is to this development that it owes its peculiar and very special character. The French have coined the word *Maderisation* to define an undesirable change of similar nature, that sometimes occurs in light dry wines on exposure to air, a change that has much in common with brown or oxidasic "casse." Fallot describes Maderisation as follows:— "The liquid takes on a yellow tinge, passing later to chocolate-brown. To the taste it shows a more or less developed vinous flavour comparable to that of Madeira. The causes of this two-fold change are

different, though they have a common origin, the oxydase of casse. The yellowing and browning are due to the oxidation of the tannin-like, colour-producing substance that exists in the liquid. As for the development of the Madeira bouquet or Maderisation properly so called, it is connected with the formation of aldehydes and organic acids. These changes are, however, oxidation phenomena." Maderisation and the development of the *Rancio* taste, or "porty" character are no doubt kindred phenomena.

The Estufa.

The same change which is out of place and a defect to be avoided, in a light delicate wine, is characteristic of the normal development of the more potent wine of Madeira. It is eagerly sought after and stimulated by artificial means. It is probable that the volcanic soil, the climate, and the vine sorts grown, each contribute to the presence of oxydase in the wine, but art plays the larger part, and the artificial stimulation of oxidation is the most striking feature of wine-making on the island. It is achieved nowadays by a process known in the trade as "stoveing," which consists in storing the young wine, when four or five months old, in closed chambers, artificially heated to a temperature varying from 110 deg. to 140 deg. F., in which the wine remains for several months. These heated stores are known as *estufas*—a Portuguese word meaning a stove or a hot-house. They are heated by iron flues from furnaces in which coal is burnt. The casks are stored on end, and a small hole is bored through the teat in the upper head to prevent bursting.

The high temperature is severe on the casks, and leakage is frequent, necessitating repeated inspection—a difficult and rather unhealthy task in the close hot atmosphere. The temperature and the duration of exposure to it, vary somewhat according to the quality of the wine. Cheap wines are stoved at 140 deg. for three months, medium quality at 130 deg. for four and a half months, whilst for choicer wines the temperature is from 110 deg. to 120 deg. for six months. The *estufa* method of rearing has been in vogue since the first years of last century. In the beginning it was looked upon with disfavour by the authorities, who sought to discourage it by means of a special tax on wine thus treated. The *estufa* nevertheless made good. J. Marques de Carvalho (in *Ampelographie*) looks upon it as the standard method. He holds that "it is to it that the wine owes the development of its bouquet, its softness, the abnormal precocity of its ageing, and the special flavour that distinguishes it from all other wines."

Other "Ripening" Methods.

The evolution of the *estufa* is interesting. Prior to its introduction, about 100 years ago, other and slower means of maturation were in vogue. A favorite one was by long sea voyages in warm climates. Instead of shipping the wine direct from Funchal to London at a cost of about £1 per pipe, it was customary to ship it via the West Indies (cost, £4 4s.), via Brazil (£5 or £6), and even via the East Indies (£7). The much-travelled wine was known as *Vinho de Roda,* the quality thus developed amply compensating for the higher freight. Only the

choicest growths were submitted to this costly treatment. Pasteur has enlightened us concerning the ageing action of a sea voyage—how it is mainly due to atmospheric oxygen. Repeated shocks of the liquid against the sides of the cask cause variations in internal pressure, resulting in expulsion of nitrogen and CO_2 and entry of air through the pores of the wood, far more active than with a wine at rest in a cold cellar.

Another ripening method, and one which no doubt prompted the invention of the *estufa,* consists in exposing the wine to the sun's rays in small pipes (92 gallons), either in the open or in glass houses specially built for the purpose. Such "sun ripening" is not peculiar to Madeira; it has long been practised in other localities. Notably, at Cette, in the extreme south of France, in connexion with the *Vins d'imitation* industry, at one time conducted on an enormous scale in that town. Likewise in the north-east of Spain. I have seen millions of gallons thus exposed at Barcelona and Reus, for periods of several months, in immense yards securely fenced or walled in, the wine being mostly contained in butts of about 120 gallons capacity. One summer's exposure matures the wine to an extent that could only be reached by several years' storage in a cellar.

The Other Factors.

We must now briefly consider the other factors responsible for the character and special type of the wine, viz., climate, soil, vine sorts, and treatment, both of the vine and of its fruit.

The tropical nature of the climate has already been referred to. The vineyards vary in altitude from just on sea-level to a couple of thousand feet above it. Aspect plays an important part on these steep hillsides, and there is a considerable difference between the north and south sides of the island, the former producing lighter and thinner wines.

The soil is essentially volcanic. Basaltic soils from an extinct volcano some 6,000 feet high have covered the original formation, which is tertiary chalk. These soils vary a good deal; some result from the decomposition of red tufa, others from yellow tufa. These volcanic rocks have broken down to form what is known as *pedra molle* or soft stone, which weathers into a very fertile soil.

The vines are rather closely planted. They are from 3 feet to 5 feet apart in the rows. The distance between the rows varies with the width and arrangement of the terraces, for most of the vine-land is terraced. Irrigation is practised in many vineyards. Sometimes the vines are inter-planted with sugar-cane and early vegetables, and these need watering. The vines are long pruned, and usually trellised at heights varying from 4 ft. 6 in. to 6 feet. Sometimes the trellises are even higher, the vines being trained overhead. In former times, especially on the northern sides of the isle, the vines were largly trained on trees, as in northern Portugal to-day. Lower trellising naturally results in fuller-bodied wines. Sulphuring is a regular operation, as might be expected under conditions so very favorable for the oidium fungus. Excessive sulphur on the grapes sometimes causes trouble in the making of the wine.

The Vine Sorts.

Many different sorts are grown, the most important being Verdelho, Sercial, Boal, and Malvasia; other wine sorts are Vidonho, Listrao, Carão de Moca, and Peringo, &c. Several red sorts are also grown, such as Tinta, Bastardo, Negro Molle, Negrinho, Maroto, &c. These last are sometimes made into red wine of rather ordinary grade, but a proportion of them often finds its way into the typical Madeira, which is not fermented on the skins. Should any colour be extracted by the press, the active oxidation in the *estufa* results in its breaking. There is thus no risk of unduly darkening the resulting wine.

A Muscat grape is also cultivated on a small scale; this seems to be the sort mentioned in *Ampelographie* under the name of Red Madeira Muscat. It is made into a special Muscat wine, and does not enter into the composition of the typical Madeira.

The first four of the above sorts are the only ones of real importance. They are sometimes made into wine separately, or two or more may be blended in different proportions.

Verdelho, more commonly known as Gouveio in Portugal, where it is also grown, is the small oval-berried grape which is well known in Australia, though not grown so much as formerly, and certainly not as much as the high quality of its wine merits. This is the leading Madeira sort, being planted more extensively than any other. Cincinnato da Costa says of it: "The wine made from Verdelho alone is delicious. When it has aged, its taste is of extreme suavity; it is oily, tonic, and of light-topaz colour wth a greenish tint, and has a very pronounced bouquet."

Sercial is also known to us. It is a harsher or rougher grape, as is indicated by its Portuguese synonym of Esgana-Caõ, which means strangle-dog. Its grapes do not seem to ever become completely ripe—they have a greenish tinge, even when rich in sugar. To this high acidity it no doubt owes its reputation for regularizing fermentation, a valuable property in a warm climate. In Portugal it is grown in several districts. J. Marques de Carvalho considers it to be the quality element in Bucellas Hock, at one time popular in England. For this wine it is blended with Arintho. It is said that the quality of Bucellas depends on the proportion of Sercial it contains; it renders the wine dry and provokes its clarification. In Madeira, according to Cincinnato da Costa, Sercial yields the driest wines, those of which it may be said that they seem to have a slight taste of Cinchona, but very choice and delicate. They represent, perhaps most correctly, the true Madeira type.

Boal, or Bual, as it is sometimes spelt, is really the name of a group of vines, for there are no less than seventeen sub-varieties of it. The two most typical are Boal Cachuda and Boal Branco. Both yield excellent wines; the first is most important on the island.

Cachudo is a Portuguese word, and means large-bunched. This sort has a rather large, slightly oval berry, and is a fair table grape. It does not seem to have been introduced into Australia, though in some respects it reminds one of our Baxter's Sherry. It is a heavy bearer

on rich soil, and its grapes yield much juice. On steep hillsides and vintaged when over-ripe, its wine is of high quality, delicate and perfumed, and of a straw-yellow colour.

Malvasia is the sort from which is made the Madeira Malmsey, this familiar name being the English version of the celebrated Grecian wine so popular in England in the fifteenth century. There is much confusion concerning the name Malvasia and its French equivalent Malvoisie. There are literally dozens of quite distinct sorts which go by these names in the different wine countries. They are often synonyms for other names, just as the names Pinot and Tokay are often misapplied, for want of a better, to sorts the correct name of which is unknown.

We have five Malvasias at the Rutherglen Viticultural Station, none of which is the Madeira sort. Two distinct Malvasias are grown on the Portuguese mainland. Malvasia Grossa, also known as Codega, is a heavy-bearing sort, distinct from the vine in question. Malvasia Fina, however, is a choice sort which, according to some, is identical with the Madeiran one. It is highly esteemed in the Alto Douro, where it yields White Port. The Madeira Malvasia is said to have come from Candia; it is a shy bearer, occasionally losing most of its bunches at blossom. Its leaves are of roundish shape, but are lobed and deeply indented. Its bunches are loose, with smallish uneven slightly oval berries of an amber-yellow, ripening a month later than the other sorts. Whereas the other Madeira grapes are, or rather were, generally made into dry wine, the Malmsey variety has always been a luscious sweet wine. It is not much grown on the island now. A vineyard once owned by the Jesuit Fathers, planted with this sort, was long celebrated for the quality of its wine.

Vidonho or Vidogna seems to be identical with Chasselas. Several old writers refer to it as one of the leading Madeira sorts. Perhaps this was so at one time; more recent literature concerning the island says little or nothing about it.

The Vintage.

The actual making of the wine is conducted on similar lines to what obtains for Sherry at Jerez (Spain). The grapes are crushed and pressed immediately, the must fermenting apart from the skins. Crushing is performed by trampling with the feet in large shallow wooden troughs called *lagares,* capable of holding enough grapes to yield about 500 gallons of must. This trampling reminds one of the Alto Douro or Port district, differing, however, in fermentation not taking place in the lagar. The juice runs off progressively, and is conveyed to the casks or vats where it ferments. A heavy beam serves for a lever to press the grapes, which, after thorough trampling, are heaped in the centre of the lagar. Though the appliances are primitive, labour is cheap and the pressing pretty thorough. The heap of marc is teased out and rebuilt several times. A stout rope coiled several times round it acts as a cage. . A further teasing and trampling facilitates the extraction of juice from raisined berries that have swelled up during the earlier stages of pressing. When no more juice can be pressed out,

the marc is again teased up and water added. The final pressing yields *Agua Pé* or Piquette, to be fermented and serve as beverage for the workmen.

The must sometimes remains for a while in a settling vat before being transferred to the pipes or vats, in which it will ferment. This settling or debourbage frees it from any sulphur that might remain on the fruit from the lavish sulphuring necessary for oidium control, and which would give an objectionable taste to the wine.

Plastering does not seem to be practised to any extent nowadays, though some of the older writers mention the addition of gypsum or "jess."

Fermentation is slow and continues until November. When it is complete, the wines are racked, graded or blended, and got into condition to undergo the stoveing treatment already outlined, which is usually carried out about mid-winter.

Fortification is by progressive additions rather than in one main operation. Small doses of spirit seem to be added during fermentation, but not sufficient to check it altogether. Madeira is, with the exception of Malmsey, a dry wine when first made, though in most cases to-day a certain amount of subsequent sweetening is practised. The spirit strength is brought to the neighbourhood of 30 per cent. proof, or even less. More than this is not needed, since the wine undergoes a distinct gain in strength during its sojourn in the *estufa*—a gain which is similar to that which occurs to Sherry in the bodegas of Jerez. The active evaporation results in water being lost through the pores of the wood more rapidly than alcohol. There is a loss of bulk amounting to 10 or 15 per cent., but the wine becomes distinctly stronger.

Whilst in the *estufa* the casks are not quite full, but a certain amount of ullage is allowed. The contact with the air thus permitted, no doubt favours the slow oxidation which is so essential a feature of the process.

The high temperature of the *estufa* is almost equivalent to pasteurization. At 140 deg. F. bacterial life ceases. The fact that lower-grade wines are treated at the higher temperature would indeed indicate that this pasteurizing effect is turned to advantage. It is no doubt more necessary in the case of cheaper wines. Oxidation and esterification are, on the other hand, very active, and in three to six months, according to the temperature, ageing equivalent to that brought about by a year's sea voyage in warm climates is accomplished. From the *estufa* the wine is transferred to *armazens* or wine-stores, where it remains at the ordinary temperature. It is a good deal out of condition after the drastic treatment it has undergone, and needs time to settle down and become properly balanced, by the slow inter-action of its different constituents, some of which are new and result from the effects of high temperature and aeration on substances originally present in the wine.

Subsequent Treatment.

This is much the same as for most wines of full-bodied type. Maturation under ordinary conditions continues until the wine has acquired the qualities it is capable of, and it is judged ready for shipment. Blending and fining constitute the finishing touches. The wine

resulting from the operations above described is dry. The present fashion being mainly for a fruity Madeira, it is necessary to give it the fruit it lacks. This is done by blending in a certain proportion of *geropiga** or very sweet must, the fermentation of which was stopped by the addition of spirit. Colour also may need intensification by the addition of *cor,* the Portuguese equivalent of the Spanish Vino de Color, made by boiling down some must to the consistency of syrup, adding fresh must to it, and allowing it to ferment. The resulting wine, which is only slightly sweet, somewhat bitter, and of the colour of stout owing to partial caramelization of the sugar, is the colour agent, when necessary, alike in Madeira, Jerez, and Malaga.

* * * * * * *

Such is a necessarily brief description of a remarkable wine—a wine which I think is worth more study than we have hitherto given it.

The vine sorts from which it is made are among the choicest grown, and some of them are quite good bearers.

Verdelho has of late years been altogether neglected here, and yet it has proved itself capable of yielding magnificent wines under Victorian conditions.

Sercial we do not know so well. Perhaps rather potent by itself, and slow in ageing, it can play a useful part in a blend where its regularizing influence should make it of real value.

Boal seems to be one of the few heavy-bearing sorts that yield wine of high quality.

The making of the wine is, to say the least, interesting. Madeira has this in common with Sherry, that the rearing of the wine exerts a paramount influence on its character, widely different though the two rearing methods certainly are.

The Portuguese are justly proud of their two leading wines. Certainly their country is privileged in being able to turn out such products as Port and Madeira. We must not forget, however, that for the evolution of these types credit is mainly due to the English merchants who for centuries have led and directed the trade. It was they who sensed the requirements of the British consumer and laid themselves out to provide wines to meet the demand, wines that are absolutely different from what is consumed in the country of their production.

* The Portuguese term *geropiga* is misapplied in our wineries to describe boiled grape juice. True *geropiga* is never boiled. It is a fortified wine, made from very ripe grapes, that has fermented to a slight extent only, if at all. It is used as a sweetening element in blends.

MANURING WASHINGTON NAVEL ORANGES.

AN EXPERIMENT AT MURRABIT.

By J. L. Provan, Orchard Supervisor.

In the winter of 1923 the groves in the Murrabit district (near Kerang) suffered severely from exceptionally wet and cold weather conditions, with the result that many trees died and those which survived received a considerable check.

One of these groves was selected by the Citriculturist (Mr. S. A. Cock) as a plot on which to carry out various manurial tests, with a view to repairing in some way the damage caused by meteorological conditions, and also as a guide to indicate possible lines of investigation in the general manuring of oranges in this district.

The experimental area was 6 acres in extent, and was conducted for a period of three years. The grove was divided into 22 large plots, and each of these was again divided into three plots. Plots 1A to 5A were duplicated and subsoiled; plots 1B to 5B were duplicated, but not subsoiled. The A plots were heavily manured, and the B plots lightly manured.

The division of the A and B plots transeversely into smaller plots allowed the various soil amendments to be tested together with the manures. An inspection of the plan of the grove (page 589) will make this lay-out clear, and will show the variety and amounts of the manures used.

It should be stated here that from the outset many difficulties confronted the experimenter, and a few of these should be mentioned.

(*a*) *Soil variability.*—In the centre of the block, including plots 5A, 6A and 6B, is a low-lying portion where the soil is of poor quality, heavy to work and difficult to irrigate. The trees on these plots had suffered most from the freeze, and many had died.

The soil on plots 7A to 11A, 7B to 11B was of better quality, being easy to irrigate and cultivate. The trees on these plots were more uniform in habit and yield than were those on the remaining plots; therefore, a comparison of these plots will be more useful than one of plots 1A to 5A and 1B to 5B.

(*b*) *Tree Variation.*—On soil so varying one would expect to find the trees showing marked differences in height and vigor. There are also, as in nearly every orange grove, variations in type, and some of these were very prominent. Odd Thompson's Improved Navels were scattered among good and poor type Washington Navels and so on.

(*c*) *Seasonal Variations in Yield.*—All orange-growers know that the influence of seasons on their yields is of the utmost importance. In these experiments a favorable season was sandwiched between a medium and a light crop. The season 1925 in this locality might be termed a medium one, 1926 a heavy one, and 1927 a light one.

(*d*) *Variations with Age of Trees.*—As orange trees become older the crops increase, and allowance must be made for this increase, which is not entirely due to the manures.

—Plan of Experimental Block—

S.W. Laugher, Murrabit.

B (LIGHT APPLICATIONS)			A (HEAVY APPLICATIONS)		
GYPSUM	CHECK	ASHES	ASHES	CHECK	GYPSUM
. .	. .	. .	. .	. .	. .
1^B Sulphate of Ammonia....5 Cwt.			1^A Sulphate of Ammonia . 10 Cwt.		
1	2	3	4	5	6
2^B Sulphate of Ammonia....3 Cwt " " Potash.....2 "			2^A Sulphate of Ammonia...6 Cwt. " " Potash.....4 "		
7	8	9	10	11	12
3^B Sulphate of Ammonia....2½ Cwt. " " Potash.....1½ " Superphosphate.....1½ "			3^A Sulphate of Ammonia...5 Cwt. " " Potash.....3 " Superphosphate.....3 "		
13	14	15	16	17	18
4^B Blood Manure .....2 Cwt Bonedust.....1 " Sulphate of Potash.....1 "			4^A Blood Manure. . . . . 4 Cwt. Bonedust. . . . . 2 " Sulphate of Potash. . . . . 2 "		
19	20	21	22	23	24
5^B Nitrate of Soda.....2 Cwt. Bonedust.....1 " Sulphate of Potash.....1 "			5^A Nitrate of Soda.....4 Cwt. Bonedust. . . . . 2 " Sulphate of Potash.....2 "		
25	26	27	28	29	30
6^B Green Cover Crop Melilotus Superphosphate. . . . . 2 Cwt			6^A Green Cover Crop Barley, Peas & Tares Superphosphate.....2 Cwt.		
31	32	33	34	35	36
7^B Sulphate of Ammonia..5 Cwt			7^A Sulphate of Ammonia..10 Cwt.		
37	38	39	40	41	42
8^B Sulphate of Ammonia . 3 Cwt " " Potash . 2 "			8^A Sulphate of Ammonia...6 Cwt. " " Potash.....2 "		
43	44	45	46	47	48
9^B Sulphate of Ammonia . . 2½ Cwt " " Potash. . . . 1½ " Superphosphate. . . . . 1½ "			9^A Sulphate of Ammonia. 5 Cwt. " " Potash . 3 " Superphosphate . . . . . 3 "		
49	50	51	52	53	54
10^B Blood Manure. . . . . 2 Cwt Bonedust. . . . . 1 " Sulphate of Potash. . . 1 "			10^A Blood Manure. . . . . 4 Cwt Bonedust. . . . . 2 " Sulphate of Potash. . . 2. "		
55	56	57	58	59	60
11^B Nitrate of Soda. . . . . 2 Cwt Bonedust. . . . . 1 " Sulphate of Potash. . . . 1 "			11^A Nitrate of Soda. . . 4 Cwt. Bonedust. . . . . 2 " Sulphate of Potash . . . 2 "		
61	62	63	64	65	66

Quantities stated are rates per acre.
Guard rows indicated thus . . .

The foregoing explanation has been made in order to show that these plots were not laid out with a view to establishing a permanent and intensive study of manuring of citrus, but rather to indicate possible lines of further investigation into such an important problem.

It is comparatively easy to overcome statistically many of the difficulties enumerated above, but this can only be accomplished by experiments carried on for a large number of years.

The chief inconvenience of so many variations without corrections is the difficulty in making the results absolutely reliable. Several methods have been tried in this experiment, e.g.:—

1. Total yield per plot.
2. Total increase in yield per plot.
3. Average yield per tree per plot.
4. Average increase in yield per tree per plot.

Most of these methods have faults, but the average yield per tree per plot over the three-year period appears the most reliable.

The Soil in the Experimental Area.

The grey alluvial clay soil of Murrabit is one of the most interesting from an orange grower's point of view. When wet it is extremely plastic and dries very hard. A chemical analysis by the Chemist for Agriculture shows it to contain a low amount of nitrogen and phosphoric acid, but it is well supplied with potash and lime. Available potash is good; available phosphoric acid is low. The water-holding capacity and organic content are satisfactory. The mechanical condition shows approximately 70 per cent. of clay and 60 per cent. very fine sand, so that it is easy to realize the plastic, tenacious nature of this soil. With such a soil, difficulties are sure to be present. Some of them are worthy of note.

1. If the soil is allowed to dry after irrigation, without cultivation, large cracks appear. These cracks are often inches wide and several feet deep. It is not hard to see the effect of such exposure and movement of the soil on the roots of the orange trees. Often the bark on the roots becomes stripped off, and, of course, many roots are killed. Cultivation prevents such cracking.

2. The roots of the orange trees are long and near the surface, and when examined show only a small number of fibrous roots compared with those of trees on a sandy or loamy soil.

3. Owing to the heavy clay content the soil is difficult to irrigate, and requires careful handling. Numerous light irrigations, allowing the water to flow slowly down the lands, give the best results.

To improve the physical condition of this soil, the Citriculturist introduced wood ashes and gypsum into the experiment, and as will be seen later both these amendments had beneficial effects.

Manurial Experiments.

Results of Application of Manures.

(*a*) Light applications of manures increased the yield to a larger extent than did heavy applications.

(*b*) The plot which consistently gave the best results was that which received—

Nitrate of soda, 2 cwt. per acre.
Bone dust, 1 cwt. per acre.
Sulphate of potash, 1 cwt. per acre.

—divided into three parts and applied in September, November and February.

The inorganic nitrogenous manures, sulphate of ammonia, and nitrate of soda are preferable to the slow-acting blood manure.

The early application of readily soluble and quickly available nitrogenous manure, e.g., nitrate of soda in September, has a decided influence on the yield. This is particularly noticeable in certain seasons, as when cold weather is experienced at blossoming time. The reason for this appears to be the stimulating effect produced early enough to influence the vigor of the flowering apparatus. Some growers say that early manuring of citrus will cause the dropping of fruit after setting, but if this is so, it is probably due to the heavy application of readily soluble and available manures.

Quality Improved by Use of Manures.

Four factors may be said to influence the quality of oranges—

1. Season and climate.
2. Yield.
3. Individuality of the tree.
4. Treatment—including (*a*) soil; (*b*) manures; (*c*) cultivation; (*d*) irrigation.

It is well known that great variations occur in Washington Navel oranges. Individual trees vary, and limbs on the same tree vary remarkably.

With so many factors influencing the quality, the task of choosing between various plots is an almost formidable one. How can a definite result be expected in three years from such a heterogeneous mixture?

The method followed in arriving at a decision of quality was as follows:—

Oranges were picked from the various plots, and from these samples six from each plot were forwarded to the Chemist for Agriculture, who analysed them for the acid content and the ratio of juice to solid matter.

Another six were judged from a commercial point of view. The thickness of the rind and the diameter of the pulp were measured and expressed as a ratio. The quality of the rind, i.e., the external appearance and the quality of the flesh, were judged from a "show exhibit" point of view.

The reduced crop on the heavily-manured plots was of poorer quality in the rind than were those crops on the lightly-manured plots. This difference was not prominent, however, and was masked often by the factors mentioned above.

The main quality improvement, from an inspection of the block, was on the plots receiving phosphoric acid—either as superphosphate or bone dust, together, of course, with nitrogen.

On consulting the report from the Chemist for Agriculture very divergent results were found. The best and the worst oranges were picked from plots receiving superphosphate and potash and nitrogen. The plot which received these manures in light amounts produced the better quality, while that in which heavy quantities were applied gave the poorer result. Also, among the best plots was a plot which received 10 cwt. per acre of sulphate of ammonia. It is when faced with such conflicting results that determining the differences in quality becomes such a difficult task.

The records here show similar disparity, plots 48, 64, and 55 being the best, while plots 34, 58, and 33 were the poorest. Plot 48 received sulphate of ammonia (6 cwt. per acre), and sulphate of potash (4 cwt.), and plot 34 had a cover crop and 2 cwt. of super per acre.

It is very evident that these results cannot be accounted for solely by the different manures, but that all or some of the aforementioned factors are playing a very important part.

Even in two consecutive years we find the results varying enormously on the same plot, and also the plot which was good one year falling back in the next.

Blood Manure.

In the Murrabit district blood manure is unsuitable for two reasons. Firstly, the stimulating effect in the early part of the season is lost, and, secondly, the after-effect has a tendency to cause the setting of large quantities of out-of-season fruit, especially if a heavy application is given early in the season, and only a light crop has set.

Influence of Soil Amendments.

The two soil amendments tested were wood ashes and gypsum applied at the rate of three tons per acre for the first season, and half this quantity for each of the two succeeding years, 1926 and 1927.

The owner of the grove (Mr. Laugher), who did his own cultivating and irrigating, found that these tasks were made easy by the application of both amendments.

When cultivating, a much finer tilth was obtained, and irrigation water soaked through the surface soil more rapidly. The better physical condition of the surface soil produced by the gypsum and wood ashes was evident by the more luxuriant growth of weeds and cover crop on the plots receiving these amendments.

It would be extremely difficult to separate these two amendments; plots receiving wood ashes showed a higher increase in fruit; but the gypsum was the better in promoting a good physical condition of the soil. The application of wood ashes would have to be heavier to produce the same result as gypsum.

Cover Crop.

A green cover crop comprising barley, peas and tares is better than *melilotus indica*. The former is reliable and abundant, grows rapidly, and is ready to plough under in the early spring, while the latter is uncertain and produces only a small amount of herbage. Added to these drawbacks, the germination of such fine seed in the heavy soil

is uncertain, and only one good germination was obtained in three years, although more than one sowing was sometimes made. With each cover crop 2 cwt. per acre of superphosphate was applied.

SUMMARY.

The most suitable manure in this district is—

Sulphate of potash, 1 cwt.
Bone dust, 1 cwt.
Nitrate of soda, 2 cwt.
} Applied in three applications—Sept., Nov., and Feb.

although the sulphate of potash could be dispensed with because of the high content in the soil of available potash.

This manure increased and maintained a high yield of oranges, and these oranges were of a desirable size and quality.

The application of soil amendments greatly improved the physical nature of the soil, rendering it more friable, and therefore easy to cultivate and irrigate. Both wood ashes and gypsum, each applied at the rate of three tons per acre, gave good results.

Barley, peas and tares, and superphosphate at the rate of 2 cwt. per acre provided a fine crop of organic material to add to the soil.

The application of manure in March is too late, because it would produce young green tips in the late autumn, and these would be killed by early frosts.

It is desired to thank Mr. S. W. Laugher—on whose grove the experiment was conducted—for his assistance and interest during the time of the test.

SALT FEEDS AND MILK PRODUCTION.

A French research worker has recently conducted experiments to indicate the influence of salted feeds on milk production. The writer's work was carried out by noting in two byres and one sheep-fold the daily product of the milking of animals to whose ration salt has alternately for periods of two weeks been added or taken away in the proportion of 10 to 15 gm. per 100 kg. live weight per day. It should be remarked that the tests have not covered a very long period, and that owing to labour difficulties it was not possible to constitute lots of animals homogeneous or comparable from all points of view.

The following are the conclusions of the tests:—(1) Taking into account the decrease of daily yield inherent in the lactation it is observed that in cows and ewes the decrease of the milk was considerably modified by the addition of salt to the rations.

(2) As regards the influence of the salt on the quality of the milk, the fear expressed in certain quarters that the increased yield in the ewes would be prejudicial to the richness of the milk does not appear to be justified. It has, in fact, been possible to ascertain, by an analysis of the samples of milk taken, some in the periol of salted feeds and others in the period of normal feeding, that the addition of salt had not diminished the richness in solids and in fats, and had even slightly increased it in some cases.—*Live Stock Journal*, 27 July, 1928.

IRRIGATION METHODS.

By L. C. Bartels, B.Ag.Sc., Senior Irrigation Officer.

The question of how to use irrigation water to the best advantage is one which should be of the greatest concern to the irrigation farmer. He should aim at the highest yield of good-quality crops with the water available, and he must avoid the evils arising from the use of too much.

There has been an evolution of methods in our Victorian irrigation districts, until now, particularly in the newer districts, approved systems are adopted, with whatever modifications are necessary to meet local conditions.

In early days, wild flooding of the land was the general practice. This was suitable only where natural grades were good. It involved practically no preparation, but entailed considerable labour if anything approaching an even distribution of water was to be effected. Usually the watering was irregular; too little would be applied to the higher places, while depressions would get too much, and, indeed, many farmers were content to fill their swamps, which provided good picking for stock during summer. Even to-day crops are sometimes irrigated by this wasteful method—wasteful of energy and of water, and productive of irregular growth—and no progressive farmer should be content to adhere to it.

A slight advance on the wild-flooding method was the practice of putting up banks with a delver, 1 foot or 1 ft. 6 in. high, which would force the water back on to higher ground by damming it up. Under average conditions, this, too, made for irregular distribution. On many places in northern Victoria farmers are content to rely on the erection of checkbanks, say, 3 or 4 chains apart, to accomplish the spread of water. Of course, results are indifferent. One sees the pasture or crop under irrigation growing in patches; an irregular design in green surrounded by stunted growth marks the reaches of the water.

Of course, by damming the banks across the direction of greatest slope of the ground, the water could be made to cover the ground more completely. Thus a phase in the development of irrigation practice was the construction of rectangular compartments from 4 to 8 chains square, and, on level ground, of even greater area. This is the method adopted now in rice culture. Rice demands abundant water, but I have seen rich land watered in that way, and in a particular instance water was being pumped at high cost, making the whole operation unprofitable.

The next advance in layout for irrigation was when the checkbanks were brought more closely together. This involved more earthwork, but the cross-check or compartment system soon discloses obvious disadvantages. In the impermeable soils water is slow to penetrate, and standing water is fatal to many crops. Porous soils absorb water readily. For a time this may mean no more than that water is being lost through deep penetration and percolation to the water-table. In Mallee soils, this became disastrous; the level of the underground water was raised, and the attendant evil of salt concentration caused barrenness.

The Border System.

Antiquated methods still survive in some of our irrigation districts, but happily in most districts modern methods prevail. What is known as the border system of irrigation is most common. Under this method, the land is divided into bays by long narrow banks which run in the direction of greatest slope. These banks may be from 20 feet to 60 feet apart—generally they are about 45 feet. The length of the bay ranges from 2 chains to 15 chains—usually about 8 chains. A channel at the head of the bays follows a fence, or it may be a more or less irregular line following the direction of a contour line. This channel carries the water. It is dammed at intervals by stops. When the water is liberated it flows down the slope, its spread being secured by levelling the bays from side to side. Cross checkbanks are not used; the holding up of water, with the consequent damage to crops, particularly to lucerne, outweighs any benefit they have in promoting a spread.

It is the irrigation of crops by the border system which I propose to discuss, also the various modifications of the system called for by different conditions, and the data available from experimental tests with lucerne and mixed pastures.

At the outset, it is obvious that the slope of the ground and the volume of water determine the rate at which it flows, and it can be understood that the rate of flow and the porosity of the ground and its grade will govern the absorption of the irrigation water. To vary the method of application so that the proper quantity may be got into the soil without waste is the business of the farmer. If the ground be porous he should reduce the time during which water is applied. He may do this by having shorter and narrower bays. If the ground has a good slope the bays may be lengthened, because on such ground the flow of the water is faster. Where the slopes are too great it may necessitate placing the checkbanks diagonally across them, or even terracing may be necessary. If there is a pronounced side fall, the banks are brought closer together, and then the levelling of these narrow bays from side to side involves the shifting of less earth. In this connexion it may be said that if there is a good depth of soil the removal of the surface in grading is not so serious.

The Rate and Frequency of Watering.

It is not uncommon to see stunted growths of lucerne, which are unprofitable and disappointing to the irrigation farmer. The plant, instead of reaching a height of, say, 18 inches, will flower when only 8 or 9 inches high.

Seeded pastures, too, often have a parched look and fail to give proper grazing because of poor development, and valuable elements in the pasture mixture die out. So with other irrigated fodders; millets and sorghums fail to reach profitable development.

Now, it may be laid down as a principle that lucerne is most productive when steady growth is maintained, and irrigation methods should be designed to that end.

When lucerne "hardens off" prematurely for want of water, irrigation then will not rectify matters, but it will induce a new growth, and if mixed pastures are not watered regularly at sufficiently frequent intervals to maintain steady growth without check through dryness, many of the plants cannot survive.

The active roots occupy a very restricted area in a dry soil, and a plant's moisture requirements are greatest under the conditions which lead to restricted root development. Such conditions are heavy soil, hardpan, puddled and baked soils.

Plants can utilize the moisture in the volume of the soil occupied by the roots, but very little that is out of reach of the roots.

The desirable rate of frequency of watering for lucerne has been worked out at Werribee in experiments which were started in 1919, and similar investigations are still under way. In these experiments quantities of water, from 18 inches per acre per annum to 48 inches per acre per annum were given to different plots, but not only was the quantity varied, the method of application was varied—e.g., 18 inches was given in three 6-in. waterings and in six 3-in. waterings; 24 inches was given in six lots of 4-in., four lots of 6-in., and eight lots of 3-in.; 30 inches in six 5-in. waterings, and five 6-in. waterings.

It was demonstrated that the growth of lucerne varied with the increasing quantities of water, even up to 48 inches, but 48 inches per annum was excessive, and after two or three seasons the lucerne thinned out.

It was established that best results accrued from the use of 2 feet of water, given in six lots, which means that six irrigations is the best frequency in a normal season and a 4-in. watering is the best rate. Six 3-in. waterings were definitely better than three 6-in. waterings. The one induced a steady although not a luxuriant growth of lucerne; with three waterings the lucerne was alternately surfeited and thirsting. It was the same with six 4-in. and four 6-in. waterings. Eight waterings of 3 inches were not as good as six of 4 inches, probably because the 3 inches of water did not penetrate deeply enough; and despite the two extra waterings, which promoted a steady continuous growth, the plots receiving 4 inches were more productive.

Experiments are being conducted to obtain similar data for the irrigation of mixed pastures.

Based on the tests with lucerne, it was shown that even under the most economical use of water—it took 600 tons of water, including rainfall, to grow 1 ton of lucerne hay.

Now, the average irrigator never considers the water costs of his crops. He regards irrigation as a disagreeable job, which he is glad to get over; in fact, pressure of other duties or engagements often lead to neglect of watering.

How many farmers ever examine the soil after an irrigation to see how far the water has gone down? I venture to state that most irrigators would be surprised to find to what a shallow depth the soil has been moistened. Of course, this is mainly because of the physical condition of the soil, and the farmer will ask, What can we do about it? If the ground will not take the water, that is an end to it, unless we can alter the character of the ground to make it more permeable. Subsoiling and the use of soil amendments suggest themselves, and improvements in soils have been effected by these means; but the most encouraging results have been obtained by greater attention to watering.

Most irrigation farmers who complain that their lucerne is usually stunted may perhaps have noted that it grows well if heavy rain falls soon after an irrigation, or if the channel breaks and gives the stand a second watering.

Now it is found that where the land is well graded and drains well the absorption of water is increased if supplementary waterings are given a day or so after the first one. On the tighter soils at Werribee, the water absorbed at the first irrigation may be only 2 inches. When the irrigation water runs over the soil it may have difficulty in entering, owing to the soil spaces being air-locked. If the irrigation is repeated next day a much smaller stream may be used, and it will spread well. Any intelligent farmer knows that if the land is badly graded or badly drained the mere repetition of watering may aggravate the troubles already existing. The crop may be "drowned out," and it is emphasized that if the ground absorbs 4 inches or more at a watering that is a sufficient quantity to apply.

Where farmers have difficulty in getting their ground to take the water it is suggested that they give this method a trial, at least on a section of a field. Further, I would urge them to have a little patience, for full results are not to be expected at once with lucerne. The effect of this method of watering is cumulative. The lucerne will be encouraged to send its roots down more deeply, traversing a greater volume of soil in search of plant food; and these roots are the best subsoilers.

One important phase is that the stronger growth of lucerne is reflected during the winter, and in spring before the irrigation season commences.

It is pleasing to note that the opposition to the measuring wheels which used to exist is disappearing, and farmers are anxious to have meters installed in their water channels. This is as it should be, because the farmer should be guided in his irrigation methods by a knowledge of the amount of water required to cover his ground. When he realizes that deficient and excessive moisture are both limiting factors in crop production his aim should be to keep within the two extremes.

How Irrigation Water is Lost.

The correct method of watering is characterized by minimum losses of moisture through evaporation, percolation to too great depths, and through surface run-off.

Losses through evaporation are kept at a minimum by maintaining a good growth of crop, which affords cover to the ground. Sometimes growth is scanty, despite free watering, because the ground needs fertilizers; and in this connexion top-dressing with superphosphate may reduce the water cost of lucerne by more than 50 per cent. This arises partly from the fact that water is the medium in which all the mineral plant nutrients are received in solution, and it is reasonable to say that, within limits, when the soil solution is poor in phosphoric acid more water has to be taken up to secure sufficient of this plant food.

Percolation to too great a depth and its effects have been referred to.

The third avenue of loss—run-off—is the one which most directly concerns the farmer and comes most under his control. Of all the factors involved in irrigation, the man with the shovel counts for most.

Great care should be taken in grading land. It means so much to the farmer in successive years by facilitating the application of water and promoting uniform growth of the crop that the expenditure of time and energy in that direction is repaid manifold.

Water is more easily controlled when fields are properly laid out, and because some run-off is almost inevitable provision should be made for drainage.

I have not referred to other methods of irrigation, such as the furrow method, the spray system, irrigation by pipes, sub-surface irrigation, because, on farms, they are very little used.

This brief article may serve as a plea for care in irrigation, because of the great importance of water in crop production. Although the efficacy of watering is governed by many things—including soil conditions—much depends on irrigation methods.

TOP-DRESSING LUCERNE.

Results of Experiments.

The 1927-28 results of the lucerne top-dressing tests conducted by the Irrigation Research Committee provide further evidence of the value of superphosphate in promoting increased yields of that crop. The plots, which were supervised by Mr. L. C. Bartels, B.Ag.Sc., Senior Irrigation Officer of the Department of Agriculture, are located at Swan Hill, Tongala, and Cohuna. At Swan Hill the tests have been conducted over a period of four years. The Tongala plots have been in operation for three years, and those at Cohuna for two years only.

In his report to the Committee, Mr. Bartels points out that splendid results have been obtained at the two former centres, while, though less striking, the yields at Cohuna amply demonstrated the value of superphosphate. At Swan Hill the most profitable response was obtained from an application of superphosphate at the rate of 6 cwt. per acre. This is the best plot in the series, and stands out in very marked contrast to the adjoining unmanured plot. The lucerne on these plots is more than nine years old, and, where superphosphate has been applied, the stand has been rejuvenated. There has been a root development in the subsoil corresponding to the increased growth above ground. The subsoil has been opened up and enriched by the penetration and decay of roots which have foraged for mineral food to a greater depth.

In addition to the spectacular results at Swan Hill, the Tongala plots afford striking evidence of the value of superphosphate for this crop. These plots show that, with lucerne on Goulburn Valley soils, increases in yield of up to 100 per cent. can be secured with dressings of superphosphate at the rate of 4 cwt. per acre. It is on the Tongala plots that the cumulative effect of the superphosphate is most apparent, as there the increase due to the fertilizer has been progressively greater each season. The difference between the heavily manured plot and the unmanured plots on each side is very marked.

The yields of the various plots at Swan Hill last season and the average yields over the last four years are shown in the following table:—

Treatment.	Yields of Hay.	
	1927–28.	Average Four Seasons.
	cwt.	cwt.
No manure	51.4	54.7
Super., 6 cwt. per acre	161.4	165.7
Super., 3 cwt. per acre	131.6	134.2
No manure	62.7	65.1
Super., 2 cwt. per acre	101.8	111.6
Super., 4 cwt. per acre	139.1	145.6
No manure	78.0	78.0
Super., 2 cwt., lime, 1 ton	115.3	125.5
Super., 2 cwt., gypsum, 1½ tons	122.4	132.2
No manure	70.6	72.0
Ground rock phosphate, 2 cwt.	86.6	83.4
Bone fertilizer, 2 cwt. per acre	79.7	85.1
No manure	58.4	65.2

In computing the results from the test plots yields were recorded for the growing period only. No record was taken of the winter growth, as the plots are grazed from after the last cut in May until August. But not the least valuable result from the manuring was the increased winter growth. During the winter months there was quite a strong shoot from the lucerne on the manured plots, while, where no manure had been applied, the lucerne was practically dormant. This is an important consideration since, at this period of the year, feed usually is scarce.

The yields at Tongala are shown in the following table:—

Treatment.	Yield, 1927–28.	Average Three Seasons.
	cwt.	cwt.
No manure	72.3	82.7
Super., 1 cwt. per acre	94.3	92.5
Super., 2 cwt. per acre	103.1	96.3
No manure	61.8	68.5
Super., 4 cwt. per acre	117.8	107.8
Super., 4 cwt. (two applications)	114.6	104.8
No manure	53.0	58.1
Super., 2 cwt., lime, 1 ton per acre	104.3	93.7
Super., 2 cwt., gypsum, 1 ton per acre	101.3	90.5
No manure	55.6	57.4
Super., 2 cwt., potash, 1 cwt.	101.3	89.3
Bone fertilizer, 2 cwt.	71.4	68.1
No manure	46.1	52.0

Both at Swan Hill and Tongala the plots manured with superphosphate were particularly free from weeds, which were spreading on the unmanured plots, especially at Tongala. In addition to the largely

increased yields that have been obtained as the result of the application of superphosphate, it is worthy of note that the fodder from the manured land is the more nutritious, feed is available when it is most valuable, and the land is cleaned.

Partly because of a plague of caterpillars the aggregate yields for the season from the Cohuna plots were not so high as in the previous year. At the same time the increases due to the manure were greater, superphosphate at the rate of 4 cwt. per acre increasing the yield by nearly 50 per cent. The actual yields at Cohuna for the two seasons were as follow:—

Treatment.	Yield, 1926–27.	Yield, 1927–28.	Average.
	cwt. per acre.	cwt. per acre.	
No manure	89.7	44.6	67.1
Super., 1 cwt. per acre	95.1	49.5	72.3
Super., 2 cwt. per acre	93.4	49.1	71.2
No manure	86.3	39.1	62.7
Super., 4 cwt. per acre	105.8	60.1	82.9
Super., 4 cwt. (two applications)	99.9	57.1	78.5
No manure	85.2	41.2	63.2
Super., 2 cwt., lime, 1 ton	103.2	57.0	80.1
Super., 2 cwt., gypsum, 1 ton	111.1	57.7	84.4
No manure	107.5	52.0	79.8
Super., 2 cwt., potash, 1 cwt.	107.0	56.5	81.8
Bone fertilizer, 2 cwt.	96.9	47.4	72.2
No manure	88.6	45.4	67.0

MILK FOR RACING DOGS.

Dog raising has in the past few years gained prominence as an outdoor sport, and in different parts of the United States expensive plants have been erected and tracks established for use during the dog racing season. Europe, also, takes interest in this sport, and its popularity has led to extensive study of diet to put and keep racing dogs in the best condition. The answer to these studies is milk. Meat ration has been reduced, and the diet for each racing dog, to keep him fit for the strain to which he is subjected, includes a pint of pasteurized milk daily.—*The Dairy.*

CONTROL OF PLANT INSECT PESTS.

By C. French, Jun., Government Entomologist.

There are many insect pests that are enemies of the tiller of the soil, whether it be on a country farm or in a suburban garden. One should try to guard against sheltering them by keeping trees, shrubs, and other plants in such good order that no opportunity is given for insects to effect a hiding place. It is very desirable to prune trees carefully and remove all loose bark and injured boughs, thus leaving a smooth surface. The removal of loose bark, especially on fruit trees, is very important, as many noxious insects hide and pupate under the bark.

Natural Enemies.

Insects have their natural enemies, which prey on them for food supplies.

Many different species of native birds greatly aid the pastoralist and others in keeping insect pests in check. Our magpies, ibises, wrens, robins, flycatchers, tree creepers, larks, laughing jackasses, and many others do yeoman service in this direction. Such birds should be afforded every protection.

Secondly, the question of biological means of control is an important one. This embraces parasitic and predacious insects. Many hymenopterous insects (wasps) do a vast amount of good in destroying large numbers of noxious insects, especially cutworms, cockchafers, codling moth and butterfly grubs, and scale insects.

The larvae of several moths also help to keep scale insects in check; one native moth in particular—known as the "Scale Eating" Moth (*Coccophaga*)—is a particularly useful insect as a destroyer of olive, eucalyptus, and other scale insects.

Carabs or ground beetles, clerids, ladybirds, and others are most useful, ladybirds being particularly destructive to peach, rose, apple, woolly and other aphids.

Quite a number of tachnids, syrphid (hovering flies), and robber flies also help considerably to keep insect pests in check.

The common green-coloured praying mantis, lacewings, and some bugs, the vine bug especially, help to destroy many noxious insects, principally moths, aphids, and vine moth caterpillars. Dragon flies, wrongly known as horse stingers, are parasitic on the larvae of aquatic insects, such as water beetles and mosquitoes.

Control by Spraying.

There are two classes of insects against which insecticides must be used; these are, first, caterpillars, grasshoppers, locusts, beetles, and other biting insects, and secondly, harlequin, Rutherglen and other plant bugs, scale insects (including mealy bugs) and the like, which suck out the sap from leaves, fruits or shoots which weaken or kill the plant. The first section of biting or chewing insects is controlled by a stomach poison and the second section of sucking insects by a contact poison.

Then there are the physical means of control.

1. *Stomach Poisons.*—These include arsenate of lead, Paris green, and calcium arsenate. Arsenate of lead is used at the rate of 1 lb. to 25 gallons of water for destroying caterpillars, locusts, grasshoppers, and beetles. Paris green is rarely used now in orchards for spraying for codling moth; it is being superseded by arsenate of lead. Calcium arsenate is used successfully against woodlice, harlequin bugs, slugs, and snails.

2. *Contact Sprays.*—Nicotine, nicotine sulphate, black leaf 40, and benzole and kerosen emulsion are the principal sprays used against harlequin bugs, Rutherglen bugs, aphids, froghoppers, canary flies, and thrips. Creosote and kerosene in equal proportions is used against borers in furniture and other timber. Red oil and other oil emulsions are excellent contact sprays, especially for scale insects.

3. *Repellents.*—Tar water, phenyle, and benzole emulsion are also used to prevent insects attacking plants.

4. *Poison Gases.*—Various gases and dusts, such as hydrocyanic acid, bisulphide of carbon, cyanogas, citrifume, &c. are used in the fumigation of citrus and other fruit trees against scale insects and orange thrips. Fumigation is also used most successfully against various household insects, especially bugs, silverfish, ants, cockroaches, book lice, and other insects.

5. *Trapping.*—The wrapping of hessian bands around apple, pear, and other fruit trees to trap codling moth and other grubs is successfully used by orchardists and home gardeners. Zinc root borer traps fastened around the trees also help to keep an orchard free from borers. Sheep-blowfly traps are being successfully used in Victoria, New South Wales, and other States—over a million flies being caught in one trap per week.

Bacterial Disease of Caterpillars.

During the summer months when cutworm, grass, cup moth, and other caterpillars are present in vast numbers, they are often attacked by a bacterial disease, which in a few days destroys every caterpillar. Some years ago grass crops in the Bacchus Marsh district were alive with cutworms, and in less than 24 hours every specimen was destroyed by this particular disease. When first affected with the bacterium the caterpillars crawl to the top of the stems of the plants and fasten themselves tightly on; soon they rot away and only the head remains.

Fungus Disease.—The ordinary house fly is often destroyed in autumn in large numbers by a fungus known as *Empusa.* The flies affected with this fungus are covered with a cobwebby-looking substance (one may sometimes see it on windows). Several species of *Cordyceps* (Elk-horn fungus) destroy the underground grubs of caterpillars which attack the roots of plants and the roots and other parts of timber trees.

Cutworms.

These caterpillars cause much damage to wheat, oats, barley, potato, onion, and other crops, also to carnations, pansies, and many other garden plants. Some of the cutworms feed both day and night, whilst others curl up and conceal themselves just under the soil, or under logs, stones, bags, bark, and rubbish during the day, and feed at night

Cutworms were exceedingly numerous last season, and should climatic conditions suit them there is almost certain to be a fair number about this season. They are easily destroyed by poison baits.

In experiments carried out by the Science Branch of the Department of Agriculture, poison baits made as follows gave excellent results. The materials required are—bran 10 lb., molasses 4 lb., Paris green 4 oz. The whole should be made into a paste or dough, and after sunset small pieces should be placed about the crops. Spraying with arsenate of lead will also give good results.

Mites.

Bryobia Mite.—These are so closely allied to insects that it has been thought advisable to include them in this article.

During last season mites were particularly bad. As they are likely to appear again this season on fruit trees, grasses, clover, peas, lucerne, and wheat, a sharp lookout should be kept for their eggs. On the apple the mites first appear on the opening leaves, many of which are thickly covered with the pests, and so the foliage is prevented from becoming fully developed. The mites continue feeding well into autumn when the leaves begin to fall. The leaves that are attacked have a peculiarly speckled or greyish appearance, owing to the rupture of their cells. On the approach of winter the mites lay their eggs in the forks of trees and in any little crevices they can discover. The eggs are of a bright red colour and are placed in clusters usually around the base of the fruit spurs on fruit trees. Sometimes they are so numerous that they cause the forks of the trees to appear as if coated with red paint. This mite does not spin a web. It is smaller than the common Red Spider.

The Red Spider.

These spiders are usually very abundant during hot weather. They are minute creatures of a reddish-grey colour; they usually feed on the under surface of leaves which they cover with a fine web. They are particularly destructive to fruit trees, as well as to French beans, dahlias, and rhododendrons.

The following control measures are recommended:—Liver of sulphur, tobacco water, nicotine sulphate or black leaf 40. The trees or plants should be sprayed in winter with lime sulphur to destroy the eggs. When possible the underside of the leaves should be sprayed thoroughly with some misty spray. All props or stakes used for supporting branches of fruit trees, dahlias, roses and shrubs should be dipped in boiling water before being used again the following season, as the crevices in the poles are great breeding places for these destructive pests. If plants be well watered in hot weather it will help to keep them free of red spiders.

Pea Mites.

These mites (often erroneously called Red Spiders) are very minute, deep dull blue in colour, and have red legs. They are exceedingly active. They run very rapidly when disturbed and soon get out of sight, hiding under plants, in crevices or under clods of earth.

During the last few years Pea Mites have increased at an alarming rate throughout Victoria. They attack crops, garden plants, vegetables (especially onions, cabbages, lettuces, beet, and potatoes), causing heavy losses to growers. They usually appear in March, and do not disappear until the hot weather arrives about the following November or December.

When they first appear the land should be deeply ploughed, and weeds, especially Cape weed, kept suppressed, as the mites breed on these. They will not live for any time in clean cultivation, but will migrate fairly quickly across ploughed country from pasture paddocks and dirty headlands. Any plot freed from the mites by cultivation or other treatment may be kept free by placing a trail of creosote, or a mixture of kerosene and phenyle, about 4 inches wide right round the plot. The mites will not be able to cross this for some weeks.

A preparation made from the following ingredients has been found to be most successful against the Pea Mite:—1 part carbolic powder (15 per cent.) mixed with 3 parts lime, super. or gypsum. The mixture should be broadcast over the plants, and worked into the soil at the rate of 2 cwt. per acre.

A mixture of tobacco dust (Pestend) and lime in equal quantities has been used in a similar way with some success by market gardeners.

Clift's Manurial Insecticide applied at the rate of $1\frac{1}{2}$ to 2 cwt. to the acre has also been fairly effective in some parts.

Nicotine sulphate, 1 lb. in 80 gallons of water in which 3 lb. of soap has been dissolved, makes a good spray for the mites.

It should be remembered that all the remedies suggested above are contact insecticides, and kill only the mites that are present at the time of application. Treatment with any of these mixtures should be repeated after about a fortnight to kill mites hatched meanwhile, and any that may have escaped.

In conclusion, I would suggest that gardens and orchards be kept as free from weeds as possible. Spray at the proper time, and apply sprays, &c., carefully.

Pamphlets on the treatment of insect pests are obtainable free of cost from the Department of Agriculture.

MAIZE EXPERIMENTS AT ORBOST.

RESULTS OF DEPARTMENTAL TESTS.

P. Ryan, B.Ag.Sc., Inspector of Agriculture.

Last year the Department of Agriculture, in co-operation with the Orbost Maize-Growers' Association, initiated a series of maize experimental plots at Orbost. These plots, which embraced both manurial and variety tests, were sown on the farm of Messrs. Aitken Bros., at Neumerella. The soil is a rich silt, typical of a large part of the fertile Snowy River Flats which have grown maize continuously for upwards of 40 years without manure, and which still produce very high yields.

The object of the tests was twofold. In the first place, information was desired as to whether the already high yields obtained at Orbost could be increased by the application of fertilizers. The second objective was to determine the most prolific of the numerous strains of maize grown at Orbost, and so, ultimately, to arrive at a standard strain or variety for the district.

In recent years much has been heard of the difficulty of keeping maize true to type. In a district like Orbost, where different varieties are grown in very close proximity to one another, cross fertilization takes place readily, and it will be very difficult, if not impossible, to keep varieties pure so long as growers have such divergent opinions as to which is the most suitable maize for the district, and continue to grow so many varieties. Until definite data is available as to relative prolificacy under Orbost conditions of the various strains, each grower is likely to maintain that his own maize is the best. The results of similar tests at Lindenow have shown fairly definitely that two closely related strains are superior to the others grown in that district, and it is hoped that in time the tests at Orbost will yield equally conclusive results.

Variety Tests.

Twenty growers supplied seed of their maize for the tests, and the strains tested included practically all the representative strains grown in the district, with the exception of one or two, which, it is hoped, will be included this year. The seed was sown on 18th and 19th October, 1927, in check rows 3 feet apart, and a good germination resulted. No manure was applied, and the check plots were sown with Aitken Bros. strain of Red Hogan. Conditions during the growing period were favorable, and good yields were obtained. There were, however, substantial differences in the yields of the various variety plots, and whilst these results are for one year only, and need to be confirmed by further tests before definite conclusions can be drawn, there are indications that a number of the varieties are much more prolific than others. Should later tests bear out these results, it will be possible to increase the yields substantially at Orbost by concentrating on these high yielding strains and discarding the others.

Results.

Plots Each Four Rows Wide and 3 Chains Long, $\frac{3}{55}$ Acre in Area.

Grower.	Yield—Bush. per acre.	Yield of Check Plot—Bush. per acre.	Increase or decrease compared with Check Plot.
Ah Chow Brothers	106	92	+ 14
G. Russell ("Canadian Pride")	109	96	+ 11
J. Perry	109	100	+ 9
K. Lynn	107	99	+ 8
G. Trewin	97	92	+ 5
C. Saunders	97	93	+ 4
J. S. Murphy (Lindenow)	103	100	+ 3
— Reynolds	98	97	+ 2
Aitken Brothers ("Red Hogan")	98	99	— 1
J. Johnston	97	101	— 4
J. W. Lynn	95	99	— 4
Telfer Brothers	87	91	— 4
G. Nixon	95	100	— 5
J. Barne (Kalimna)	94	100	— 6
J. Lynn	92	100	— 8
Aitken Brothers ("Golden Beauty")	93	102	— 9
G. Russell ("Reid's Imported Dent")	86	95	— 9
W. Gubenow	82	91	— 9
J. Lynn ("Neumerella Wonder")	85	101	— 16
W. Cummings	82	99	— 17

All maize yields reduced to 14 per cent. moisture content.

The maize which gave the highest comparative yield is one that has been grown by Messrs. Ah Chow Brothers for fourteen years. It originated as a cross between Early Yellow Dent and Sibley. At one time it showed a trace of red colour, probably due to an infusion of Red Hogan maize, but this has been eliminated by selection, and the grain is now an amber colour with a light yellow cap. Typical cobs are 10-11 inches long, with sixteen rows of closely packed grain. The grain is fairly broad and deep, with a slight rough dent. The time of maturity is about seven months.

The variety second on the list was Canadian Wonder, supplied by Mr. G. S. Russel. This maize was obtained at London, Canada, by Mr. Russel's father, while on a visit to that country. It is a tall growing maize, with large yellow cobs with a smooth dent. Mr. Russel also entered in the test a plot of Reid's Yellow Dent, which he had also obtained from Canada a few years ago. While this maize has given excellent results on his farm, it did not show up well in the test plots this year.

The maize supplied by Mr. K. Lynn was developed from Funk's Yellow Dent, imported some years ago by Mr. H. James, of Orbost, but has been crossed with Sibley through being grown alongside that variety. Mr. Lynn has for the last few years made a practice of selecting his seed in the field, and finds that the results justify the extra work involved.

Mr. Frewin's maize was the well-known white variety, Cornplanter, which also was imported into Orbost some years ago by Mr. H. James.

Manurial Tests.

The manurial plots were sown on the replicated system. Each manurial treatment was repeated three times, and a "no manure" check plot was sown alongside each manurial plot. This system is designed to give increased accuracy, and, with it, it is possible to calculate the reliability of the results obtained.

Results.

Plots Each Four Rows Wide and 3 Chains Long, Sown in Check Rows 3 Feet Apart.

Plot.	Yield.	Check Plot. Yield.
Super., 1 cwt.	87·8	87·5
Super., 3 cwt.	83·1	84·0
Sulphate of ammonia, 1 cwt.	86·9	86·2
Super., 3 cwt., + sulphate of ammonia, 1 cwt. ..	88·9	86·6

Note.—All yields reduced to the basis of 14 per cent. moisture.

In no case did the application of fertilizer have any appreciable effect on the yield. In the early stages of growth, the manurial plots seemed to be making more vigorous growth, but this was not reflected in the yield at harvest time. While the results are for one year only, and further tests over a period of two or three years will be necessary to eliminate any seasonal effect, the indications are that, on the rich land at Orbost, success in improving the maize yield is more likely to be obtained by attention to seed selection and cultivation methods than by the application of fertilizers.

Cultivation methods at Orbost are generally of a high standard, but there is no doubt that much more attention should be given to the selection of seed maize. Where growers are favoured with such fertile land that even badly selected seed will give high yields, there is always a strong temptation to become slack in matter of seed selection, but this has to be overcome if the maximum yields are to be obtained. At the present time, when the price of maize is so low, it is more than ever necessary that maize growers, particularly on such high priced land as that at Orbost, should not overlook any detail that will increase their returns. There is no doubt that the most certain means of doing this is to pay more attention to seed selection. In particular it may be confidently stated that the yield of maize per acre in Victoria would be improved considerably if growers could be prevailed on to select their seed maize in the field instead of from the barns, as so many do now. When seed is selected from the crib, only the size and shape of the ears can be considered, and there is no means of telling whether the best looking ears have come from prolific plants, or in other words, whether they owe their superiority to hereditary characters or to better conditions of soil and moisture.

The kind of plant from which seed should be taken is one which is free from disease, has desirable field characters, and which, without having any advantage in environmental conditions, is a more prolific yielder than the plants surrounding it.

There is no doubt that the practice of selecting seed from the crib has been responsible for the maize in East Gippsland becoming later in maturity. The biggest ears have been sought without any regard being paid to the fact that they have taken longer to mature. By judicious selection in the field this tendency can be checked and uniformity of ripening secured.

It will be found advisable to make a further examination in the barn of the ears selected in the field, and only those showing the following characteristics should be retained:—Freedom from disease; good size and weight; high percentage of grain to core; trueness to type; and a full supply of sound, heavy grain.

In view of the fact that a fungus disease, Dry Rot or Cob Rot (*Diplodia zeae*), has caused very serious losses in other maize districts, the attention of growers may be drawn specially to the necessity of selecting seed from plants and cobs showing absolute freedom from this disease.

Acknowledgment is made of the assistance given by Messrs. Aitken Bros., and the Secretary (Mr. Rodwell) and President (Mr. Cumming), of the Orbost Maize Growers' Association.

PIG BREEDING IN DENMARK.

The most practical and efficient system of swine breeding in existence is the one used in Denmark for the last few decades. It was planned and organized by the late P. A. Morkeberg. All breeders co-operate under the leadership of the Department of Agriculture in maintaining certain high standards and in producing the finest type of market hog. The registered breeding stock of the country is maintained in State-supervized breeding centres. Any farmer who has shown his ability over a period of time to raise purebred hogs can, upon application, have his farm certified as a breeding centre. Every animal intended for breeding purposes in such a centre must be approved by a representative of the Department of Agriculture, and its progeny must be subjected to a production test in one of the three Government swine breeding experiment stations before such a breeding animal can be certified and registered.

Four pigs from each sow are sent to the breeding station, there constituting an experimental lot. The rapidity of growth and economy of gain is ascertained, and upon reaching a weight of 200 lb. the pigs are slaughtered and subjected to a detailed killing test. This standard of achievement is extremely practical, for it does not involve show-yard winning or extreme production of any sort, but rather the ability to beget litters that will make a quality export bacon as cheaply as possible. If a sow fails to demonstrate sufficient fertility or produces pigs that do not measure up to the standard, she will not be admitted to the herd, and no offspring from her can be registered.

The detailed results of all tests are published annually, and furnish a valuable guide for breeders who are anxious to perfect the production qualities of their herds. This method of breeding, stressing fertility, economy of gain and killing qualities has increased the economy of feed conversion from 4.5 to 3.5 lb. of feed per lb. of gain, has increased the average size of litter over two pigs, and has raised the percentage of export quality animals to more than double that originally secured.

—*Live Stock Journal*, 27th July, 1928.

COOL STORAGE OF APPLES.

Report on Samples Exhibited in the Government Pavilion, Royal Show, 1928.

By E. Meeking, State Supervising Officer (Fruit, &c.).

Many readers of this *Journal* who visited the Show and saw the exhibit of apples there may be somewhat puzzled as to its meaning; a short *résumé* of the circumstances which led to the display may therefore be of interest.

During the 1926 apple export season samples of apples were taken from various shipments for analysis, to determine the presence or otherwise of arsenical spray. As a check, a duplicate of each sample submitted to the Commonwealth Analyst was placed in the Government Cool Stores, Victoria Dock. During that season several prominent business and public men who had visited the United Kingdom and Europe complained bitterly on their return of the unsatisfactory condition in which a large proportion of our fruit was landed on the overseas markets. The matter was freely discussed, both in Parliament and in the press, and the consensus of opinion was that growers should never have thought of exporting fruit of such poor quality, and that Government officials were blameworthy for permitting it to be shipped. Officials and exporters, however, maintained that the fruit was in good condition at the time it left Australia.

When the controversy was at its height some one recollected the samples which were lying at the Government Cool Stores. These were removed and exhibited at State Parliament House in September, 1926, where they were viewed by the Commonwealth Minister for Markets (Hon. T. Paterson, M.H.R.), the then Minister for Agriculture (Hon. M. W. J. Bourchier, M.L.A.), and many other members of Parliament. Over 95 per cent. of the samples of all varieties of fruit exhibited was found to be in excellent condition. Representative samples are shown in Plate II.

Description of Exhibit.

Owing to the failure of the apple crop in 1927 the quantity exported from this State was too small to justify the taking of samples, but the experiment was repeated during the 1928 season. As the quantities of fruit shipped then (906,469 cases of apples and 80,308 cases of pears) exceeded any previous total, the number of samples taken was necessarily greater than was the case in 1926. In all, 264 samples were collected. Each consisted of two apples of the larger sized fruit

(2⅞ in. to 3¼ in), three apples of medium sized fruit (2½ in. to 2¾ in.), and four apples of smaller sizes (2⅛ in. to 2⅜ in.).

The samples were taken at the ship's side during loading. They were placed in small cardboard boxes, and, on completion of the loading of each vessel, were sent to the Government Cool Stores, and there placed in chamber 35, which is used for odd lots of fruit. For this reason it is constantly being opened, and is probably subject to more fluctuations of temperature than any other chamber in the Stores. The temperature during the months in which the samples were stored is shown in Table I. below. The rise in temperature during July, August, and September was due to the large storage of locally grown citrus fruits during those months.

Table I.—Showing Temperature Log in Chamber 35, Government Cool Stores, during Storage of Samples.

February	33.6	
March	34.4	
April	33.7	
May	33.9	
June	33.7	
July	34.5	Rise in temperature due to placing citrus fruits in the chamber.
August	35.2	
September	35.2	
Average temperature of chamber	34.2	

The vessels from which the samples were taken, the number of samples from each, the date of storage, and period of storage, are shown in Table II.

Table II.—Showing the Vessels from which Samples were Taken, the Date of Storage, etc.

Vessel.	Date of Sailing.	No. of Samples Stored.	Date of Storage.	Period of Storage.	
				Weeks.	Days.
	1928		1928		
Narkunda ..	14 February ..	22	15 February ..	31	..
Horatius ..	22 „ ..	6	23 „ ..	29	6
Berrima ..	24 „ ..	8	25 „ ..	29	4
Ferndale ..	29 „ ..	5	1 March ..	28	6
Otranto ..	6 March ..	5	7 „ ..	28	..
Barrabool ..	10 „ ..	4	12 „ ..	27	2
Mooltan ..	13 „ ..	5	14 „ ..	27	..
Largs Bay ..	14 „ ..	5	15 „ ..	26	6
Otira	23 „ ..	11	26 „ ..	25	2
Comorin ..	27 „ ..	12	28 „ ..	25	..
Moreton Bay ..	28 „ ..	11	29 „ ..	24	6
Themistocles ..	4 April ..	3	5 April ..	23	6
Maloja	10 „ ..	4	11 „ ..	23	..
Hobson's Bay ..	11 „ ..	5	12 „ ..	22	6
Baradine ..	14 „ ..	26	16 „ ..	22	2
Osterley ..	17 „ ..	16	18 „ ..	22	..
Ulysses	21 „ ..	18	23 „ ..	21	2
Moldavia ..	24 „ ..	26	25 „ ..	21	..
Euripides ..	28 „ ..	20	30 „ ..	20	2
Orama	7 May ..	26	8 May ..	19	1
Benalla	10 „ ..	26	11 „ ..	18	4
		264			

The samples were removed from storage and placed in the exhibit on the 19th September, 1928. Each sample was placed separately on a paper d'oyley with a card underneath numbered from 1 to 264. (See Plate III.) Unfortunately the light from the windows behind the exhibit prevented the details from appearing in the photograph as clearly as could be wished. The illustration, however, gives a fair indication of the extent of the exhibit, and also the range in sizes of the fruit.

In all, fruits from 21 vessels and 48 railway stations were exhibited. Details of the former are shown in Table II., and of the latter in Table III.

Table III.—Showing Railway Stations from which Samples in the Exhibit were Forwarded.

District.	No. of Plates Exhibited.	District.	No. of Plates Exhibited.
Amphitheatre	2	Nilma	1
Ararat	8	Nutfield	1
Bacchus Marsh	1	Officer	3
Bairnsdale	1	Pakenham	21
Beaconsfield	6	Pomonal	15
Bunyip	6	Portland	3
Campbell	12	Quantong	4
Cranbourne	2	Red Hill	10
Croydon	7	Ringwood	7
Diamond Creek	2	Sedgwick	4
Drouin	6	Somerville	5
Elphingstone	8	Strathfieldsaye	1
Emu Creek	1	Stawell	3
Emerald	2	St. Leonards	2
Faraday	4	Strathewen	2
Garfield	7	Tyabb	15
Hastings	6	Tynong	2
Harcourt	42	Upper Beaconsfield	4
Hurstbridge	7	Upper Pakenham	1
Longlea	1	Waubra	1
Longwarry	1	Wheeler's Hill	3
Mossiface	1	Whittlesea	3
Narre Warren	9	Yan Yean	4
Nar-Nar-Goon	1	Yarra Glen	2

A total of 32 varieties of apples were shown (*vide* Table IV.), and the sizes ranged from 2 inches to 3¼ inches.

The fruit was removed from the exhibit on 1st October, twelve days after removal from cool storage. As each sample was removed from the exhibit it was examined and its condition was carefully noted. The results are shown in Table IV. These do not give a quite accurate indication of the condition of all the specimens in each sample, as if any of the specimens in a sample showed signs of deterioration the whole sample was judged accordingly. On this account the exhibit contained a larger proportion of sound fruit than the table would indicate. This method of judging was enforced by pressure of routine staff duties. However, it is considered to be an error in the right direction. The atmospheric temperatures, taken from official meteorological records during the period of the exhibit are shown in Table V.

Table IV.—Giving Details of Condition of Fruit on Removal from the Exhibit at the Royal Show, on 1st October, 1928.

Variety.	Samples Exhibited.	Conditions of Fruit on removal from Exhibit on 1st October, 1928.													
		Internal Breakdown.		Wilt.		Scald.		Bitter Pit.		Jonathan Spot.		Fungal Diseases.		Unaffected Fruit.	
		E.	S.	E.	S.	E.	S.	E.	S.	E.	S.	E.	S.	F.C.	G.C.
Alfriston	4	1	..	..	3	..	..	..	..	..	..	..	..	..	..
Buncombe	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Cox Orange Pippin	2	..	..	1	..	..	1	..	..	..	..	..	..	..	..
Cleopatra	15	..	..	2	5	..	..	..	2	..	..	..	..	..	6
Delicious	2	..	..	..	..	..	..	..	..	..	..	..	..	1	1
Democrat	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Doherty	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Duke of Clarence	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Dunn's Seedling	27	..	..	..	2	..	2	..	..	..	..	..	..	10	13
Edna May	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Eagle's Seedling	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Esopus Spitzenburg	2	..	..	..	..	..	..	..	..	..	..	..	..	2	..
Granny Smith	7	..	..	..	..	3	2	..	..	..	..	..	..	1	1
Hoover	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Jonathan	64	..	..	20	11	..	8	..	..	15	2	..	..	3	5
King David	6	2	3	..	..	..	..	..	..	..	..	..	..	..	1
London Pippin	19	..	..	5	6	..	..	..	..	..	..	1	..	2	5
Ben Davis	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Reinette du Canada	6	..	..	2	2	..	..	..	..	..	..	..	..	2	..
Rome Beauty	34	2	3	4	1	..	..	..	..	..	..	1	..	13	10
Rymer	15	2	3	3	1	..	1	..	..	..	..	..	1	1	3
Rokewood	11	..	..	..	..	..	..	..	..	..	..	..	..	5	6
Scarlet Pearmain	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Schroeder	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Shockley	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Statesman	6	..	..	..	..	..	..	..	..	..	..	..	..	5	1
Stewart's Seedling	3	..	..	1	1	..	..	..	..	..	..	..	..	1	..
Sturmer	9	1	..	..	..	..	..	..	..	..	..	..	..	6	2
Stone Pippin	14	..	1	..	..	..	..	..	..	..	..	..	..	4	9
Strawberry Pippin	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..
Stayman's Winesap	3	..	..	..	..	..	..	..	..	..	..	..	..	3	..
Yates	4	..	..	..	..	..	..	..	..	..	..	..	..	3	1

Note:—E denotes Excessive; S denotes Slight; F.C. means Fair Condition, i.e., Fruit was unaffected by apparent change in tissues but was lacking in flavour. G.C. means that fruit was crisp, juicy and in good marketable condition.

Table V.—Showing Range of Atmospheric Temperatures during the Period the Samples were on Exhibition at the Show.

Date.	Temperature (Fahr.)	
	Highest.	Lowest.
September 19	71	53
„ 20	81	55
„ 21	57·9	50·9
„ 22	69	40
„ 23	58	47
„ 24	62	52·2
„ 25	75	45·7
„ 26	79·2	53·2
„ 27	70	54
„ 28	88·6	49·2
„ 29	61	55
„ 30	69	55
October 1	64	52

Plate I.—Exhibit of Samples from 1926 Export Season shown at State Parliament House, September, 1926.

HARCOURT PER MORETON BAY LEFT MELBOURNE 14-4-26
PAKENHAM PER NALDERA LEFT MELBOURNE 16-3-26
HARCOURT PER OSTERLEY LEFT MELBOURNE 23-3-26
HARCOURT PER PORT BRISBANE LEFT MELBOURNE 19-3-26
HARCOURT PER OTRANTO LEFT MELBOURNE 9-3-26
HARCOURT PER SOPHOCLES LEFT MELBOURNE 10-4-26
PAKENHAM PER ESPERANCE BAY LEFT MELBOURNE 17-3-26
STAWELL PER ORONSAY LEFT MELBOURNE 20-4-26

Plate II.—Representative Samples from Exhibit at State Parliament House, September, 1926.

Objects of the Experiment.

The experiment was made for the following purposes:—

1. To ascertain if the results would confirm those of the 1926 experiment, which seemed to show that apples of many varieties, of different sizes, from various localities, and cool stored under ordinary commercial conditions, could be kept sound for periods ranging from four to seven months, or from three to five times the period necessary for transit to British and European markets.

2. To ascertain if the unsuccessful transit of consignments of fruit to overseas markets arose mainly from an oversight of some general, but perhaps vital, principle, or from matters connected with variety, maturity, or sizes of fruit, or from climatic, soil, or other local influences.

The object of the exhibit at the Royal Show was to suggest the inadvisability of drawing conclusions as to the condition of fruit when shipped from Australia from the appearance of consignments when landed on overseas markets.

Significance of the Exhibit.

In March, 1928, the Empire Marketing Board issued a report (Special Report No. 3) on fruit investigation during the Australian and New Zealand season 1927.

This report contains much valuable and interesting matter on the deterioration of fruit in transit from Australia and New Zealand to the United Kingdom. It is understood that copies may be obtained through Messrs. Gordon and Gotch, Little Collins-street, Melbourne, and a perusal of the report is recommended to all who are interested in fruit transportation problems. The report is divided into four sections as follows:—I. General. II. Transport in the ship. III. Types of wastage occurring in imported Australian and New Zealand fruit. IV. The distribution of wastage in Australian and New Zealand apples and factors influencing its occurrence.

Briefly the investigation may be said to have established the following:—1. Some varieties of apples are more susceptible to wastage than others. 2. Locality appears to influence wastage. 3. Wastage is more prevalent in large apples than in medium size apples of the same varieties.

In view of the above the main points of interest in connexion with the exhibit are as follows:—1. All samples of varieties of varying sizes from 48 localities, with the exception of six apples (less than 3 per cent. of the total) were in good marketable condition when removed from cool storage. The six apples in question were attacked by *Penicillium* s.p., which had gained entrance to the fruit by initial puncture of the skins. 2. No naked eye evidences of internal breakdown, wilt, scald, or bitter pit were apparent in any of the samples until the 25th October, or six days after removal from cool storage. 3. From the 25th September, deterioration in all samples, with the exception of Dunn's Seedling, Granny Smith, Rome Beauty, Stone Pippin, Delicious, Cleopatra, Statesman, Sturmer, Democrat, Stayman's Winesap, and Yates, rapidly set in. In the last three days of the exhibit from 28th September to 1st October, the deterioration was accelerated probably through the

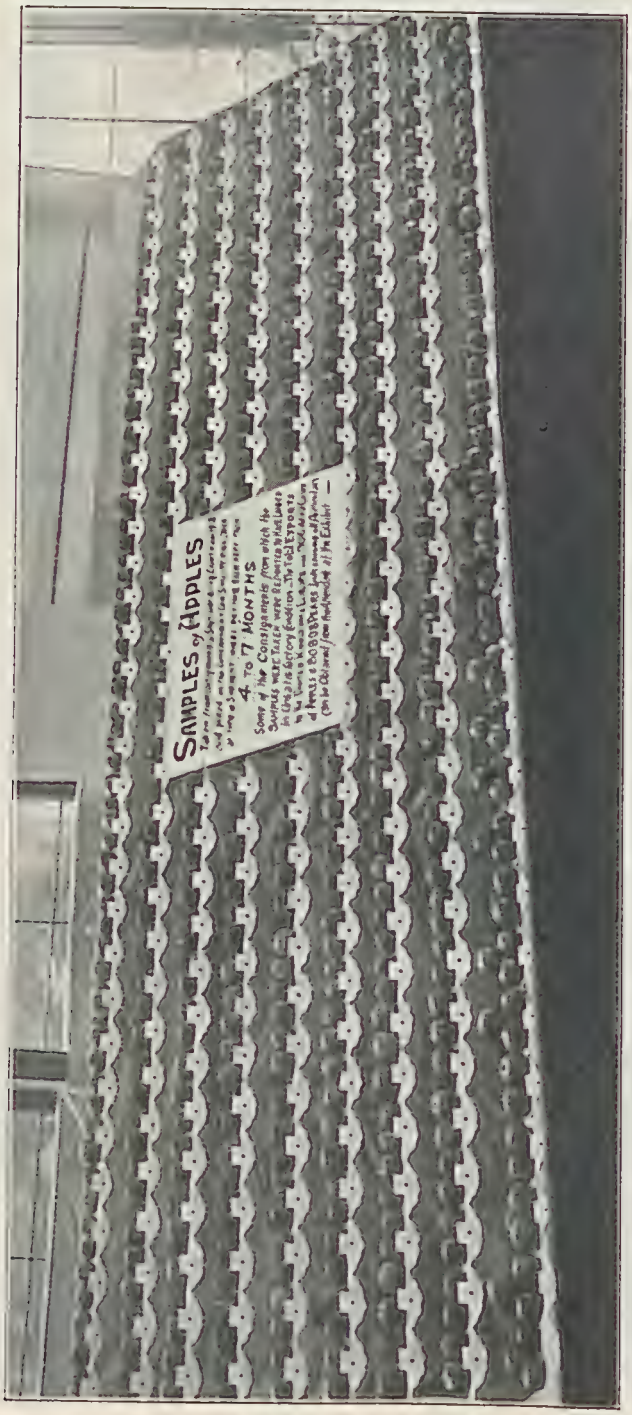


Plate III.—Samples of Apples taken from Consignments at Ship's Side during 1923 Export Season and placed in Government Cool Stores, Victoria Dock, where they were kept from 4 to 7 months.

extraordinary rise in atmospheric temperature on 28th September, to 88.6° Fahr. This was particularly noticeable in the Jonathans, which developed Jonathan spot, and in the Granny Smiths, in which an extensive browning of the skin resembling scald took place, affecting five out of the seven samples. It will be noticed that Cleopatra was the only variety in which bitter pit developed, two specimens becoming slightly affected on the 30th October.

The evidence to be adduced from this exhibit regarding the factors which control the successful storage and long distance transport of apples, are not conclusive, as the experiment was not carried out under scientific methods of observation and control. Despite this the results appear to indicate that the matter of maturity and sizes of apples, and in perhaps a lesser degree the suitability of varieties, and the influences of locality, climatic and soil conditions are not such important factors in ensuring successful transport of apples as the general, but apparently vital, principle of cooling the fruit to temperatures of 32° Fahr. to 35° Fahr. as soon as possible after harvesting, and to maintain these temperatures until the fruit arrives at its destination.

Acknowledgment.

The writer wishes to thank Mr. W. L. Gregory, of the fruit inspection staff, and the officials at the Government Cool Stores for their assistance in preparing the exhibit at the Royal show.

VEGETABLE PRESERVATION.

By Miss M. Knight, Assistant Fruit Preserving Expert.

For preserving vegetables, much the same utensils are required as for fruit bottling. One may use any of the preserving outfits which are on the market, or a waterless cooker, or a home-made outfit such as is illustrated in Bulletin No. 43—Bottling and Drying of Fruit for Home Use—of the Department of Agriculture.

Any kind of preserving jar may be used as long as it is made absolutely air-tight.

To avoid a certain amount of repetition, I shall first give general directions for preserving vegetables, and then the details for each variety of vegetables.

Always choose fresh, young vegetables, and treat them as soon as possible after picking. When cleaned, &c., they are ready for blanching. This blanching is done for various reasons. One is, that it loosens the skins of such vegetables as tomatoes, carrots, parsnips, &c., and thus they are easier to peel. Another reason is to shrink the vegetables, so that a full pack is more easily made. It also removes a certain pungent flavour, and lessens the time required for sterilizing.

To do the blanching, have a large pan of boiling water on the fire. Put the vegetables in a piece of butter muslin, or old clean cloth, and immerse them in the boiling water for the necessary length of time; then plunge immediately for half a minute into a bowl of cold water, the colder the better. All vegetables are given half a minute only in

the cold dip. If left too long they begin to take up the water. This cold dip causes the pulp to shrink, checks the cooking, and helps to set the colouring matter.

Next, pack the vegetables into the clean preserving jars which should then be filled with cold boiled water, or, if preferred, the filling liquor may be flavoured with a little salt and sometimes sugar, according to the variety of vegetable being preserved. As soon as the jars are filled, stand them in a cold sterilizer, or boiler, and boil them for the given time. Then lift the bottles out on to a folded wet towel, and overflow with the filling liquor at boiling heat similar to that previously used, and immediately seal.

One process should follow the other as quickly as possible, or a form of fermentation known as "flat sour" may set in. There should be no delay between the blanching, cold-dipping, and sterilizing.

Now I shall give the details for the different kinds of vegetables.

Peas.

Peas are nicest if picked just before they are full grown. Shell and grade them. Do not put large and small peas in the same jar, for the small ones will mash up and spoil the appearance of all. Blanch the peas for ten minutes, cold dip for half a minute, pack them into the jars, and fill with plain water. If desired the water can be flavoured by adding 1 oz. of salt and 1 oz. of sugar to each quart of liquid. Boil the water with the salt and sugar for about ten minutes, then strain and put aside to cool.

Sterilize the jars of peas for three hours, then overflow with the boiling filling liquor, and seal.

French Beans.

French beans must also be young and tender. String them carefully, and cut into any desired size, or leave whole. If sliced, blanch them about five minutes; if left whole, give them ten minutes. Then cold-dip, pack into the preserving jars, and finish in the same way as peas.

Asparagus.

Clean this well. Then tie it up in bundles to make it easy to handle for the blanching. Do not forget to grade for size when tying up, that is, do not put thick and thin pieces in the same bundle.

The thick ends of the asparagus require a longer blanching than the delicate tips, and the best way to do this is to stand the bundles in the preserving pan with the boiling water reaching only just over the thick ends. Allow them to boil like this for fifteen minutes, then add sufficient boiling water to cover the asparagus, and give it another five minutes' boiling. Then cold-dip, untie the bundles, and pack them into the preserving jars. Take care not to break the tender tips. Fill the jars with water that has been salted to taste, and sterilize for three hours. Then overflow with the boiling water and quickly seal.

Carrots and Parsnips.

Carrots are easily preserved. Bright-coloured ones will, of course, look nicer than pale ones. Scrub them clean, and half-cook them in slightly salted water; then cold-dip. Rub off the skins with a piece of butter-muslin, or any coarse clean cloth. The carrots may be bottled whole, or cut lengthwise, or in slices, just as preferred. Fill up the

bottles with slightly salted water, or a little sugar may also be added, the same as for beans. Sterilize for an hour and a half.

Parsnips are treated in the same way as carrots. If liked, both vegetables may be mixed in the bottles. When cut in slices and packed in alternate rows they look very nice.

Cauliflowers.

Choose cauliflowers with nice firm white heads. Lay them in salted water for a while to clean them, then break into sprays; do not make the sprays too small, or the appearance of the finished article will not be so nice.

Blanch for five minutes, cold-dip, and pack the sprays in the preserving jars. Fill with slightly salted water, sweetened if preferred, and sterilize an hour and a half. Then overflow and seal.

Greens.

Spinach, silver beet, and young turnip tops are washed in several changes of water. Instead of being blanched in boiling water, these greens should be steamed for about fifteen minutes. This results in less waste of mineral matter, also they will retain a better colour. When steamed, pack into the jars solidly like pulp, and sterilize for two hours without added water, then seal down immediately.

Pumpkin.

Pumpkin is treated in exactly the same way as the greens. A firm solid pumpkin is much more suitable for preserving than a watery one. Just peel, seed, and cut it into blocks, then treat the same as spinach, &c. For the blanching, the pumpkin may be steamed, or dipped in the boiling water.

Tomatoes.

Tomatoes should be selected ripe, but firm. They may be peeled or not, as preferred. If they are to be peeled, blanch them in the boiling water for three or four minutes, and cold-dip. They will then peel quite easily. They may be packed in the jars whole, or cut in slices. If sliced, place the rings of tomatoes on end all round the jar; they will look much more attractive than when packed with one slice lying flat on top of another. Fill with plain water, or flavour with salt and sugar. Then sterilize fifteen minutes. Tomatoes are more like fruits for preserving in that they are sterilized when cooked; other vegetables take a much longer time for sterilizing. Also blanching is not necessary if the tomatoes are not being peeled.

Turnips.

When preserving turnips, only the small tender ones should be used. Peel and blanch them for fifteen minutes. Pack into the preserving jars, and fill up with water which has been salted to taste. Sterilize for two hours.

Beetroot.

Choose the deeply-coloured beets. Wash them, and avoid breaking the skins. Leave on a portion of the leaf stalks and the rootlet so as to prevent bleeding during the processing. Boil them until three-parts cooked, then cold-dip, and rub off the skins and pack into the preserving jars. Fill with water and sterilize for an hour. Instead of plain water, a filling made from the following ingredients may be used:—1½ pints of water, ¼ pint of vinegar, 2 oz. sugar, and 1 oz. salt.

STALLION REGISTER 1928-29.

Under "Horse Breeding Acts 1919-1925."

Part 2.—Registrations after 1st August and prior to 1st October, 1928.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
675	Abbot's Best ..	A	Draught ..	J. Egan ..	Barwite
565	,, Pride ..	A	,, ..	W. H. Gadd ..	Wodonga
726	Admiral Sperry ..	A	,, ..	D. Mathieson ..	Waitchie
688	Ahitana Bold ..	3	,, ..	Mitchell and O'Brien	Melbourne
556	Allan Stewart ..	A	,, ..	N. R. Croxford ..	Earlston
648	Almont M ..	A	Light ..	J. Minns ..	Melton
608	Angle Jack ..	A	,, ..	C. F. Hillas ..	Tallangatta
626	Ashton Stamp ..	5	Draught ..	G. H. Winnett ..	Reidy Flat
506	Attraction's Champion	A	,, ..	W. Morley ..	Rutherglen
599	Auchen Star ..	3	,, ..	S. J. Lynn ..	Orbost
584	Aussie Didblitz of Fenwick	3	Pony ..	Mrs. D. Maclean	Yan Yean
610	Axedale Prince ..	A	Draught ..	J. McDonald ..	Ultima
727	Baron	A	,, ..	W. Holland ..	Warracknabeal
555	,, ...	A	,, ..	W. Maguire ..	Barwidgee
629	,, Douglas ..	A	,, ..	J. Petrie ..	St. Arnaud
567	,, Grove ..	5	,, ..	M. Shiells ..	Youanmite
534	,, Lee ..	A	,, ..	J. D. White ..	Minyip
531	,, Loch ..	3	,, ..	Kempton and Sons	Camperdown
623	,, MacAndrew	3	,, ..	P. Kane ..	Nathalia
674	,, Prince ..	A	,, ..	R. P. Banko ..	Simmies
622	,, Style ..	A	,, ..	J. P. Belleville ..	Watchem
734	,, Victor ..	A	,, ..	A. L. Smith ..	Ellerslie
647	Baron's Pride ..	4	,, ..	Rigby Bros. ..	Hamilton
596	,, Royal Chief	A	,, ..	C. Appleby ..	St. Arnaud
581	,, Star ..	A	,, ..	F. Lehmann ..	Lismore
712	Belmont Again ..	A	,, ..	W. A. Creighton	Alexandra
583	Berkeley Bantam	A	Pony ..	R. Crozier ..	South Morang
649	Berwick Victor ..	A	Draught ..	A. L. McLeod ..	Kyabram
705	Black Wasp ..	A	Pony ..	E. Wheelahan ..	Ballan
521	Bobbie	A	,, ..	E. Barratt ..	Traynor's Lagoon
650	Bold Douglas ..	A	Draught ..	W. G. Wilkinson	Yarrawonga
621	Bonnie Baron ..	A	,, ..	R. N. Scott ..	Kongwak
651	,, Belmont ..	A	,, ..	J. T. Watkins ..	Euroa
520	Bright Star ..	3	,, ..	J. Walker ..	Corio
620	Brilliant Jim ..	6	Pony ..	R. N. Scott ..	Kongwak
585	,, Morn ..	5	Draught ..	W. Crozier ..	South Morang
711	Briton's Bold ..	5	,, ..	F. W. Lennecke	Detpa
624	Bronte Dean ..	4	Light ..	H. K. Thompson	Newlyn
547	Bush Lark ..	A	,, ..	W. H. Penaluna	Boolarra
728	Calais	A	Thoro'bred	G. Officer ..	Woolsthorpe
522	Carlesberg Prince	6	Draught ..	A. E. Albert ..	Willaura
594	Cavan Boy ..	4	,, ..	S. Chapman ..	Katunga
546	Centredale ..	A	,, ..	J. Opie ..	Werribee
592	Cherry Farm Standard	A	,, ..	W. Bunworth ..	Yenda, N.S.W.
533	Child Zebra ..	6	Light ..	T. Thompson ..	Kooloonong
595	Colonel Garfield ..	A	Draught ..	Millard Bros. ..	Dean's Marsh

* For Registrations prior to 1st August, see Part I—printed in this *Journal* for August, 1928.

STALLION REGISTER, 1928-29—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
708	Colonel Mac ..	6	Draught ..	L. Taylor ..	Leitchville
715	Comet	A	„ ..	W. Henderson ..	Grasmere
652	Conqueror ..	A	„ ..	M. McKinnon ..	Berriwillock
718	Cooring Monarch	3	„ ..	V. Dahlenburg ..	Culcairn
653	Creeper	A	Pony ..	F. A. Brown ..	Traralgon
654	Crofthead Douglas	A	Draught ..	H. Davies ..	Bellarine
545	Cyanide.. ..	A	Pony ..	J. Moore and Co.	Yarram
532	Cymbrel ..	A	Light ..	S. Hancock ..	Poowong
632	Dalcrombie ..	A	Draught ..	J. Rumbold ..	Laanecoorie
719	Dalla Derby ..	3	Light ..	F. W. Shillito ..	Yendon
607	Dalmore Again ..	A	Draught ..	J. A. Todd ..	Beulah
570	Dalradient ..	3	„ ..	J. B. Ferguson ..	Waubra
618	Dandy Lad ..	A	Pony ..	Stuckey Bros. ..	Flynn
548	„ Luck ..	6	„ ..	Mrs. M. L. Johnson	Mount View, Doreen
729	Dibdale ..	A	Thoro'bred	G. Officer ..	Woolsthorpe
676	Dixie Wood ..	A	Light ..	F. W. Shillito ..	Yendon
628	Domination ..	A	Pony ..	C. T. Lucan ..	Pomborneit
655	Don Huon ..	A	„ ..	W. Lyons ..	Drouin
609	Douglas Chief ..	5	Draught ..	P. O'Loughlin ..	Ouyen
720	Duke Mauritius ..	A	Light ..	F. McClelland ..	Boort
730	Duncan Stewart ..	A	Draught ..	F. G. Fitzpatrick	Heyfield
507	Dundonald's Chief	A	„ ..	H. Doherty ..	Yundool
707	Dunmore's Pride..	A	„ ..	J. Doherty ..	Bungaree
538	Earlstone ..	4	„ ..	N. Ramsay ..	Newbridge
554	Eaton Headlight..	A	„ ..	E. W. Schneider	Yulecart
731	Edwin Wilkes ..	A	Light ..	E. Rash ..	Ballarat
633	Eclypse ..	A	Draught ..	A. McKinnon ..	Walpeup
697	Erigator ..	A	„ ..	T. Doyle ..	Lockington
575	Excelsis Regulus..	4	„ ..	A. Strawhorn ..	Barfold
544	Factotum ..	A	„ ..	G. Grimmer ..	Wickliffe
558	Famous Voyage ..	6	Light ..	P. H. Beaumont	Ouyen
588	Fashion Bow ..	A	Draught ..	H. H. Leathart..	Melbourne
616	Fashion's Model ..	A	„ ..	A. B. Hamilton..	Fish Creek
619	Firebrick ..	A	Light ..	P. Higgins ..	Heyfield
504	Fleuriste ..	A	Thoro'bred	Mrs. P. E. Blackley	Dimboola
695	Gallant Jock ..	A	Draught ..	W. Hooper ..	Bungeluke
656	Gay Bold ..	A	„ ..	Amarant Bros. ..	Landsborough
634	General Harvey ..	A	„ ..	H. E. Byron ..	Woomelang
716	Glen Dale ..	4	„ ..	C. White ..	Yarra Glen
745	Glengarnock ..	A	„ ..	B. McKenzie ..	Bass P.O.
561	Gobbler ..	A	„ ..	G. Dunnett ..	Stockyard Hill
557	Grand Derby ..	A	Light ..	W. Balloch ..	Auburn
614	Guy Hawkes ..	A	„ ..	Mrs. G. Burns ..	Wallan
645	Gwalia Caesar ..	A	Pony ..	E. McKoy ..	Wodonga
627	Gypsy Hero ..	A	Draught ..	Mrs. A. G. Andrew	St. James
690	Hard Times ..	5	„ ..	J. Kerlin ..	Nanneella
657	Harry Rose ..	A	Light ..	E. Allan ..	Ondit
553	Heather Douglas..	A	Draught ..	W. G. Young ..	Neerim
677	Herdsman's Treasure	A	„ ..	W. J. Cobbledick	Bunbartha
615	His Majesty ..	A	„ ..	M. Frawley ..	Leigh Creek
625	Homeward Bound	A	Light ..	D. & J. McCamey	Tinamba
701	Jack Tar ..	A	Draught ..	J. C. Duffy ..	Lorquon
704	Jimmy Direct ..	A	Light ..	J. Isaac ..	Inglewood
746	„ Lea ..	A	„ ..	W. Bradshaw, Snr.	Skipton
725	John Brigham Last	A	Pony ..	G. N. Buckley ..	Wickliffe
523	„ Shepherd ..	A	Draught ..	A. F. Dahlenburg	Salisbury

Stallion Register, 1928-29—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
735	Kelly	A	Pony ..	D. Kennedy ..	Murtoa
658	Kelm Pride ..	A	Draught ..	C. Lippiatt ..	Scotsburn
747	Kelmscott II. ..	A	„ ..	A. R. Yard ..	Murrayville
559	King Cal ..	6	Thoro'bred	D. Campbell ..	Merino
589	„ Dale ..	4	Draught ..	P. Glenane ..	Tollern Vale
528	„ Heedless ..	5	Thoro'bred	J. Manifold ..	Weerite
678	„ John ..	A	Draught ..	A. Cail ..	Kamarooka
543	King's Pride ..	6	„ ..	J. Fallon ..	Iona
635	„ Prize ..	A	„ ..	D. Cuthbert ..	Weerite
748	Kingston ..	A	„ ..	R. P. Nicol ..	Yarram
749	Lackmore ..	A	Light ..	W. R. Cahill ..	Kyabram
733	Laird Again ..	A	Draught ..	C. Fawcett ..	Campbelltown
590	„ Douglas ..	4	„ ..	A. C. Jorgensen ..	Katyil
601	Lee Creek Favourite	A	„ ..	Ewart Bros. ..	Dargalong
642	Leonard Dale ..	6	„ ..	D. McDonald ..	Cobram
571	Lieutenant ..	4	„ ..	McQueen Bros. ..	Waubra
737	Little Leo ..	A	Pony ..	Mrs. A. Bray ..	Croydon
659	„ Argyle ..	A	„ ..	W. H. Lyon ..	Sale
533	„ Brigham ..	A	„ ..	J. A. Tuckett ..	Leongatha
736	„ Comet ..	A	„ ..	F. Hoystead ..	Wangaratta
686	„ Wonder III.	A	„ ..	N. J. Ridd ..	Molesworth
722	Logan Design ..	3	Light ..	J. D. Mulfahey ..	Windsor
562	Lonsdale Again ..	A	Draught ..	J. Leighton ..	Yarram
524	Lord Jellicoe ..	A	„ ..	McMahon Bros. ..	Merrinee
578	„ Lothian ..	5	„ ..	A. J. Turner ..	Redesdale
525	„ Percival ..	A	„ ..	J. Beard ..	Terang
536	„ Wallace ..	A	„ ..	M. C. Smith ..	Dumosa P.O.
750	Lost Time ..	A	Thoro'bred	A. Martin ..	Maffra
539	Lowland's Marshall	5	Draught ..	A. Kennedy ..	Arcadia
613	Lymm Loden ..	A	„ ..	A. F. Emery ..	Tarnook
537	Major Again ..	A	„ ..	D. H. Coutts ..	Minyip
661	„ Dale ..	A	„ ..	J. Forster ..	Boort East
580	„ Douglas ..	A	„ ..	J. W. Scott ..	Dimboola
636	„ Lee ..	6	„ ..	E. V. Menzel ..	Armytage
717	Maritimus ..	A	„ ..	T. J. Opie ..	East Kew
641	Mark Hazel ..	A	Pony ..	G. C. Seymour ..	Gundowring
612	Marshall Clyde ..	A	Draught ..	R. F. Fraser ..	Birchip
591	Master Baron ..	3	„ ..	F. H. Baker ..	Jung
723	McKenna of Shetland Heights	3	Pony ..	Mrs. J. Maclellan	Windsor
751	Merrimu ..	A	Light ..	G. M. Wallace ..	Cohuna
587	Merry King ..	A	Pony ..	Jas. Dellora ..	South Wangaratta
577	„ Oliver ..	A	Thoro'bred	T. Hassett ..	Caramut
517	„ Prince ..	5	Draught ..	B. Rogers ..	Mepunga
679	Middlerigg Referee	A	„ ..	W. P. Schodde ..	Murtoa
522	„ What's Wanted	A	„ ..	E. McKoy ..	Wodonga
630	Modelavon ..	4	„ ..	R. C. Gordon ..	Drumanure
680	Model's Herod ..	A	„ ..	M. Hutcheson ..	Pine Grove
572	Montrose ..	A	„ ..	P. McNaughton ..	Wycheproof
739	Moving Picture ..	A	Light ..	G. H. Alford ..	Murrumbeena
515	Newton's Pride ..	5	Draught ..	J. T. Ibbs ..	Camperdown
662	Ngapar	A	Light ..	E. Allan ..	Ondit
681	Nyallo Prince ..	A	„ ..	W. T. McAlpine ..	Hopetoun East
663	Onward Star ..	A	Draught ..	R. Williams ..	Dunbulbalane
703	Patrus	A	Thoro'bred	R. Biggar ..	Waaia
566	Playfair ..	5	Draught ..	W. Wright ..	St. Arnaud East

STALLION REGISTER, 1928-29—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
569	Pleasant Journey	5	Light	W. G. Pharoah	Warragul
593	Pocket Edition	A	Pony	A. Sutherland	Welshpool
682	Poilu	A	„	Cross Bros.	Goroke
602	Preble	A	„	A. F. McKenzie	Hexham
603	Premier Jack	A	Draught	W. Vaughan	Condah
542	Prince Buchlyvie	A	„	G. W. Pennel	Elsternwick
683	„ Ecuador	A	Thoro'bred	F. Hender	Broomfield
694	„ Harold	A	Pony	H. Robertson	Wallacedale
586	Raseel	4	Arab	Mrs. D. Maclean	Yan Yean
665	Real Scotch	A	Draught	R. Dunbar	Harston
666	Referee	A	„	E. Allan	Ondit
693	Richard III.	A	Pony	A. Ruttle	Inverloch
706	Rising Morn	A	Draught	A. Gillies	Newmarket
646	Rizzio	A	Thoro'bred	H. A. Currie	Burrumbeet
560	Robinhood	A	Draught	J. McKee	Clarendon
604	Roseneath Baronet	A	„	R. Trimble	Rutherglen
644	Roseworthy	A	Light	E. Allan	Ondit
667	Roy	A	Pony	J. B. Cleeland	Newhaven
740	Royal Charm	A	Draught	T. H. Smith	Lalbert
563	„ Craig	A	„	H. Trimble	Pine Lodge
518	„ Dale	4	„	M. Kennedy	Winslow
637	„ Escort	A	„	T. A. Griffiths	Glenrowan
741	„ Gartley II.	6	„	S. Sleep	Warracknabeal
638	„ Garvin	A	„	F. Brown	Belmont
742	„ George	A	Pony	W. H. Collins	Nagambie
743	„ Hero	A	Draught	F. E. Robins	Maffra
576	„ Hiawatha	4	„	Jolliffe Bros.	Newlyn
597	„ Robin	A	„	Coghill and Son	Boort
541	„ Robin	A	„	A. Hando	Woosang
710	„ Simon	A	„	M. J. Bland	Narracoorte
732	„ Sunbeam	6	„	N. Ramsay	Newbridge
530	„ View	6	„	S. Landers	Salisbury
526	Royalty	A	Pony	W. Coe	Coleraine
551	Scotland's Bloom	A	Draught	R. P. Rodgers	Natimuk
691	„ Viceroy	A	„	W. J. Witney	Warracknabeal
660	„ Victor	4	„	Clyne Bros.	Tinamba
668	„ Victory	A	„	A. Peucker	Sea Lake
631	Scottie	A	„	T. Fulham, Jnr.	Torumbarry
744	Selkirk	A	Thoro'bred	A. Scott	Elmore
669	Seymour	A	Draught	J. Cleeland	Newhaven
684	Shepherd Again	A	„	W. P. Schodde	Murtoa
549	Shepherd's Boy	A	„	I. Kelly	Korong Vale
579	Sheppard Lad	5	„	W. A. Harbick	Tungamah
605	Siam	A	„	C. Calaby	Ararat
700	Silver King	A	Light	J. J. Nulty	Carwarp
611	Silverlight	A	Pony	R. T. Jarvis	Cudgewa
568	Simon's Son	3	Draught	T. A. Nicholson	Campbelltown
509	Sir Bute	A	„	J. M. Thomson	Stratford
510	„ Everest	A	„	A. Ralston	Lucknow
714	„ Richard III.	6	Pony	W. Henderson	Grasmere
670	„ William	A	Draught	W. A. McClellan	Bungaree
513	Some Style	A	Light	P. Pilicas	Collingwood
696	Southern Star	A	Draught	J. Maher	Rynaby
508	St. Aidan	A	Light	M. Cribbes	Faraday
639	Starlight	A	Pony	J. Giles	Bairnsdale
698	Stylish Kennedy	4	Draught	L. T. Powles	Cobram
598	Surprise Journey	5	Light	W. Balloch	Auburn

Stallion Register, 1928-29—*continued.*

Cert. No.	Name.	Age.	Class.	Owner.	Address.
		Yrs.			
505	Tam O' Shanter Bill	A	Draught ..	G. Gordon ..	Ellerslie
564	The Dux ...	A	„ ...	J. Hargreaves ..	Dederang
574	„ Globe ...	A	Light ..	J. Barker ..	Coburg
702	Thoughtful ...	A	Pony ..	P. McIntosh ..	Ondit
685	Tommy Burns ...	A	„ ...	D. A. Terrill ..	Rutherglen
672	Tracey Voyage ...	A	Light ..	Mackin Bros. ..	Korong Vale
689	Tuxedo Rock ...	A	„ ..	W. J. Hueston ..	Hawthorn
643	Unaford Quality ..	4	Draught ..	W. Little ..	Clyde
692	Vanguard ..	A	„ ..	R. Jackson ..	King Island
516	Viceroy Favourite	4	„ ...	Harris Bros. ..	Garvoc
687	Vintage ...	5	„ ...	Mitchell and O'Brien	Melbourne
512	Wee Charlie ...	5	Pony ..	J. T. Dawkins ..	Colac
713	Widgiewa Baron ...	6	Draught ..	R. Stewart ..	Tolmie
724	„ Blackwood	5	„ ...	A. Gillis ..	Newmarket
527	„ Cavalier	A	„ ...	A. Gordon ..	Nhill
673	„ Ivo ...	A	„ ...	E. McKoy ..	Wodonga
671	William Sportsman	A	„ ...	W. A. Dehnert ..	Ballan
511	Winsome Chief ...	A	„ ...	C. R. Petersen ..	Kellalac
606	Worthy Footprint	4	„ ...	W. G. Ballantine	Cosgrove
540	Young Comet ...	A	Pony ..	T. Adkin ..	Korumburra
699	„ Linkwood	A	Draught ..	R. Simons ..	Fish Point
550	„ Lymney Champion	A	„ ...	W. H. Penaluna	Boolarra
660	„ Simon ...	A	„ ...	J. Raymond ..	Sedgwick
514	„ Starling ...	A	Light ..	W. Regan ..	Moonee Ponds
640	Zone Time ..	A	Draught ..	J. Gibson ..	Benambra

PIG FEEDING EXPERIMENTS.

By A. J. Gill, Senior Herd Tester.

Towards the end of last year and at the beginning of this year two experiments, designed to test the value of rape as portion of a pig's ration, were conducted at Miss Raleigh's farm "Goronga," Pakenham Upper.

I.

For the purpose of this test a litter of nine pure Large White pigs, born on 18th December, 1927, was chosen. On the 3rd February, 1928, when they were 47 days old, their total weight was 258 lb., an average of 28.66 lb. They were weaned on the 20th February, and while running on the rape were fed from a self-feeder.

Hereunder are notes on the experiment—

On 27th February, 1928 (first period), in 24 days had increased by 168 lb. Food consumed, 167 lb., equal to .994 lb. per pound live weight gain.

On 22nd March, 1928 (second period), in 24 days increase equalled 301 lb. Food consumed, 873 lb., or 2.7 lb. per pound live weight gain. Initial weight, 258 lb. Total live weight on 22nd March, 1928, equal to 727 lb., or increase of 469 lb.

Total food consumed, 980 lb., equal to 2.09 lb. per pound live weight. Three porkers (Nos. 125, 129, and 131), initial weight equal to 93 lb. On 22nd March, 1928, their live weight was 263 lb., an increase of 170 lb.; 170 lb. x 2.09 (average food per pound live weight), equal to 355 lb. food consumed. Final weight, 309 lb., an increase of 46 lb. Food consumed equal to 119 lb., or 2.1 lb. per pound live weight gain.

Total food consumed by the three porkers equal to 474 lb., or 2.225 lb. per pound live weight gain.

The cost of the food worked out at 1d. per pound; 190 lb., less 61.6 per cent. of 93 lb. (initial weight), i.e., 57 lb., equal to 133 lb. net gain, at 1d. per pound for overhead expenses, equal to 11s. 1d.

Dr.	£	*s.*	*d.*	*Cr.*	£	*s.*	*d.*
To 3 pigs at 10s.	1	10	0	*By* 190 lb. pork at 9½d. ..	7	10	5
454 lb. food at 1d.	1	17	10				
1d. per lb. overhead expenses	0	11	1				
Grazing on rape 9½ weeks at 3d. per pig per week ..	0	7	1				
Balance net profit	3	4	5				
	7	10	5		7	10	5

Cost per pound of pork 5.43d.

Litter of Pure Large Whites (9), born 18th December, 1917. Weaned 20th February at 64 days old.

Sex.	No.	First Weight (47 days old), 3.2.28. Live Weight.	Second Weight (Age, 71 days), 27.2.28. 24 days.			Third Weight, 22.3.28.		
			Live Weight.	Increase.	Increase per day.	Live Weight.	24 days' Increase.	Age, 93 days. Increase per day.
		lb.	lb.	lb.	lb.	lb.	lb.	lb.
S. ..	124	34	52	18	·75	86	34	1·41
B. ..	125	31	50	19	·79	87	37	1·54
S. ..	126	30	49	19	·79	80	31	1·29
B. ..	129	30	51	21	·87	84	33	1·37
S. ..	130	26	41	15	·62	72	31	1·29
B. ..	131	32	54	22	·91	92	38	1·58
S. ..	132	28	47	19	·79	80	33	1·37
B. ..	133	25	42	17	·70	71	29	1·20
B. ..	134	22	40	18	·75	75	35	1·45
Total ..		258	426	168	..	727	301	..
Average ..		28·66	47·3	18·66	·777	80·7	33·44	1·4

LITTER OF PURE LARGE WHITES, &c.—*continued.*

Sex.	No.	Fourth Weight, 2.4.28. 10 days.			Light, Weight at Factory.	Difference.	Dressed Weight.	Per cent. Dressed to Live Weight at Farm.	Per cent. Dressed Weight at Factory.	Per cent. Loss.
		Light Weight at Farm.	Increase.	Increase per Day.						
		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
S. ..	124	..	..	..	..	..	..	..	..	..
B. ..	125	103	16	1·45	94	9	63	61·16	67	33
S. ..	126	..	..	..	..	..	..	..	..	..
B. ..	129	99	15	1·36	90	9	61	61·61	67·77	32·23
S. ..	130	..	..	..	..	..	..	..	..	..
B. ..	131	107	15	1·36	98	9	66	61·66	67·34	32·66
S. ..	132	..	..	..	..	..	..	..	..	..
B. ..	133	..	..	..	..	..	..	..	..	..
B. ..	134	..	..	..	..	..	..	..	..	..
Total ..	..	309	46	..	..	..	190	..	..	..
Average	..	103	15·33	1·39	..	..	63·63	..	..	..

II.

For No. II. experiment a litter of seven Middle Yorks, born on the 20th November, 1927, was chosen. At the beginning of the test on the 3rd February, 1928, their total weight was 297 lb. As in the previous experiment, these pigs were grazed on rape; the other feed given them was fed from a self-feeder.

First period (to 27th February, 1928), 24 days, weight increased by 166 lb. Food consumed, 351 lb. at 1d., equal to £1 9s. 3d.; 166 lb. live weight, increase for 351 lb. food, equal to 2.11 lb. per pound live weight.

Second period (to 22nd March, 1928), 24 days weight increased by 191 lb. Food consumed, 607 lb., equal to 3.12 lb. per pound live weight.

Third period (to 2nd April, 1928), 11 days. Assuming there was the same loss as in Large Whites from farm to factory weights, viz., 9 lb. per pig, the live weight of six pigs would be 714 lb., or an increase of 102 lb. for the consumption of 339 lb. of food, equal to an average increase per pig of 17 lb. live weight, or 1.55 lb. average per day, and 1 lb. live weight for each 3.32 lb. of food consumed.

Total food consumed was 1,297 lb., at 1d., equal to £5 8s. 1d.

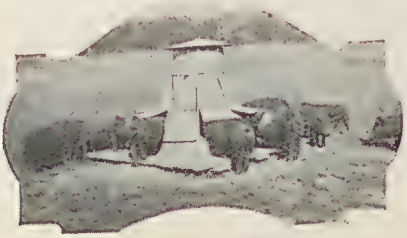
Initial weight 297 lb.; final estimated weight, 714 lb.; increase, 417 lb.; 417 lb. increase for 1,297 lb. of food, equal to 3.11 lb. per pound live weight, at 1d., equal to 3.11d. per lb.; 481 lb., less 73 per cent. of 297 lb. (initial weight), i.e., 219 lb., equal to 262 lb., net gain at 1d. per pound for overhead expenses, equal to £1 1s. 10d.

Debit.	£	*s.*	*d.*	*Credit.*	£	*s.*	*d.*
To 6 pigs at 10½ weeks old at 12s. 6d.	3	15	0	*By* 481 lb. pork at 9½d. ..	19	0	9
1,297 lb. food at 1d. ..	5	8	1				
1d. per lb. overhead expenses ..	1	1	10				
Grazing on rape 9½ weeks at 3d. per pig per week	0	14	3				
Balance net profit	8	1	7				
	19	0	9		19	0	9

Cost per pound of pork, 5.44d.

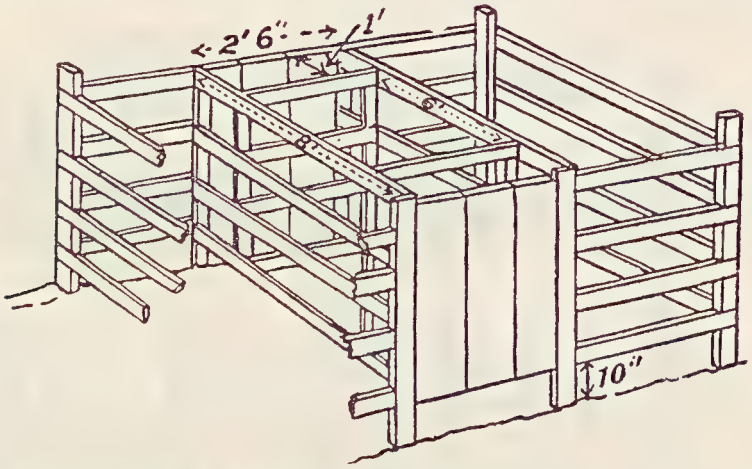
The food consisted of two parts pollard (58 per cent.) and one part barley and oat pollard (30 per cent.), 10 per cent. meat meal, and 2 per cent. bone meal.

No.	First Weight 3.2.28. Age. 75 days.	Second Weight, 27.2.28 (24 days). Age, 99 days.			Third Weight. 22.3.28 (24 days). Age, 123 days.			Fourth Weight 21.4.28(11 days). 134 days. At Dandenong Factory.		Dressed to Live Weight. Per cent.	Loss Live to Dressed Per cent.
	Live Weight.	Live Weight.	Increase.	Increase per day.	Light weight Killed.	Increase.	Increase per day.	Live Weight.	Dressed Weight.		
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
117 ..	34	42	8	·33	..	..	..	..	..	..	..
118 ..	45	72	27	1·12	103	31	1·29	112	82	73·21	26·79
119 ..	48	77	29	1·20	109	32	1·33	116	84	72·41	27·59
120 ..	46	74	28	1·17	109	35	1·41	115	83	72·17	27·83
121 ..	41	64	23	·95	92	28	1·16	100	73	73·00	27·00
Blank ..	38	63	25	1·04	96	33	1·37	105	77	73·33	26·67
122 ..	45	71	26	1·08	103	32	1·33	112	82	73·21	26·79
Total ..	297	463	166	..	612	191	..	660	481	..	..
Average	42·42	66·1	23·7	·987	102	33·3	1·387	110	80·1	72·88	27·12



FARROWING PEN.

The illustration shows an improved type of farrowing pen for sows, designed and used successfully by Mr. D. M. Stewart, the officer in charge of the pig section at the Dookie Agricultural College (Vic.). The essential feature is the central race, 2 ft. 6 in. in with, with the bottom rail 10 inches off the ground, and a false end 1 foot away from the door at each end, the bottom rail of which is also 10 inches from the ground. The pen or sty has a door opening outwards behind each false end. The latter is made in the form of a lift gate, and pinned in position when the sow is confined to the race. When raised, the door of the sty may be opened. The reason for a door at the opposite ends of the sty is because the race is not wide enough to allow the sow to



turn round, and she is let out at one end for feed and exercise, and driven back through the other door. The false end is necessary to prevent the little pigs from being crushed against the door. Mr. Stewart made the central race a fixture in the first pens fitted, but now uses movable hurdles made of 4 x 1½ hardwood, the ends being dropped into slots fixed to the end walls, and a hinged stay from the top rail to the side wall to prevent the hurdle being pushed outwards. By this means any pen can be converted into an emergency farrowing pen. Mr. Stewart uses a scant supply of short straw in the middle division, but abundance of long straw in the outer compartments. For the first day or two after sucking the young pigs are placed in the straw. They quickly develop the habit of retiring as soon as satisfied, and burying themselves in the straw, where they are safe from injury, clean, and comfortable.

PIG FEEDING EXPERIMENTS IN GREAT BRITAIN.

It was in 1916, when the war interfered with the normal supply of concentrated feeding stuffs, that the use of fish meal became at all general in rations for fattening pigs. Feeding trials demonstrated its value, especially for growing animals; since then there has probably been no other feeding stuff that has excited so much controversy. The result was a greatly increased demand. The Animal Nutrition Research Institute, Cambridge, the Rowett Research Institute, Aberdeen, and the Harper Adams Agricultural College, Newport, decided to carry on investigations with a view to finding a substitute for fish meal, and it was on two points: (1) that the increased demand was almost greater than the supply, with the result that the price was higher than many farmers felt justified in paying; and (2), the serious opposition by pork butchers and bacon curers to its use. At the same time, there is considerable evidence to show that, when it is properly used, fish meal of good quality does not materially affect the quality of bacon or pork. The course of the investigations is now reported on by Mr. H. R. Davidson, of the Rowett Institute.

As previous experiments had shown considerable and confusing variations in results, it was decided to carry out a co-operative investigation in an attempt to obtain a reliable check, and to arrive at conclusions which could safely be applied in practice.

The Problem to be Solved.

Mr. Davidson points out that in the case of the fattening pig the value of fish oil is very doubtful. The problem, therefore, resolved itself into finding substitutes for the highly digestible protein and for the mineral matter represented by the bones and salt which are found in fish meal. At the two institutes only pure-bred Large Whites were used; at Harper Adams, cross-bred pigs out of Large White Essex sows, and all by the same Large White Boar, were used. With one exception wet feeding was employed. Normally three feeds per day were given while the pigs were small, but for the greater part of the time a morning and an evening feed were the rule. All pens were given as much food as they would clean up, and free access to drinking water was given at some centres, but not at others. All the pigs were housed in similar pens with concrete floors and with the same exposure.

As it proceeded, the investigation fell naturally into three main groups. The first of these aimed mainly at making a preliminary survey of the problem by determining the relative values of the protein and of the mineral fractions of fish meal. This having been ascertained, the next move was to test the value of several of the available vegetable and animal proteins in conjunction with the necessary minerals. During this part of the investigation the substitutes, although giving nearly as good growth results as fish meal, appeared to be responsible for a rheumatic or "crampy" condition, which was particularly noticeable with some kinds of bean meal.

The third group of experiments was therefore concerned with determining the best kind of bean meal to use, and with making further alterations in the mineral mixtures used so as to get each ration balanced by its own particular mineral supplement.

The Experiments.

The first group of experiments having demonstrated the relative importance of the mineral and protein fractions, the second part of the investigation was devoted to examining the injurious effects of bean meal, especially when fed without a mineral supplement. The general observation on the effect of bean meal was that although when combined with a mineral supplement it led, at first, to nearly as good growth as fish meal, it produced a "crampy" or rheumatic condition, which eventually became acute, and interfered with the amount of food consumed, and so, indirectly, with growth.

Finally, having determined that oil had little special value for growth, that the mineral part of the supplement was of very considerable importance, and that, under certain conditions of mineral balance, the vegetable proteins gave satisfactory results as regards live weight increase, the last part of the investigation was devoted to testing two or three supplements which there was reason to believe would be successful. Both English bean meal and extracted soya bean meal had already proved of value, and other results had indicated that decorticated ground-nut meal was to be considered in the same category.

Only two stations were actually able to take part in the last experiment, but the results obtained were in very close agreement, as will be seen from the first part of the following table. From this it will be seen that, on live-weight increase, the only outstanding pen was the soya meal pen (Lot 3), the rest being equal within the probable range of normal variations. The other results are equally similar and only the averages for the two stations are given.

The results, therefore, indicate that by properly balancing vegetable protein foods and a combination of minerals, it is possible to rely upon obtaining as rapid growth as when fish meal is employed, and to maintain the pigs in excellent health throughout the feeding period.

Pen.	Live weight gain in lb. per day.				Meal consumed per 1 lb. gain.	Cost per 1 lb. of food.	Cost per 1 lb. gain.	Health and condition.
	I.	II.	Av.	Fish meal =100.				
					lb.	*d.*	*d.*	
(1) Fish meal ..	1·33	1·26	1·30	100	4·00	1·16	4·64	Very good
(2) Soya meal ..	1·38	1·28	1·33	103	4·00	1·12	4·48	Very good
(3) Soya meal ..	1·48	1·31	1·40	108	3·81	1·06	4·04	Very good; skin poor
(4) Earth-nut meal..	1·39	1·23	1·31	101	4·10	1·11	4·55	Fair; skin excellent
(5) Soya, plus earth-nut meal	1·34	1·24	1·29	99	3·98	1·11	4·41	Fair; skin fair

AUSTRALIAN BUTTER AND CHEESE EXPORTS, 1927–28.

According to the annual report of the Dairy Produce Control Board for the year ended 30th June, 1928, there was a substantial increase in the production of butter and cheese as compared with the previous season. During the season 44,306 tons of butter and 3,298 tons of cheese were exported overseas, being an increase on last season of 10,302 tons of butter and 1,530 tons of cheese. The destination of butter exported during the past season was—to the United Kingdom 38,138 tons, and to other countries 6,168 tons. Of the total quantity of cheese exported 3,083 tons were shipped to the United Kingdom.

Butter.—The quantities shipped to the United Kingdom from the various States were—

Queensland	19,436 tons
Victoria	10,164 ,,
New South Wales	7,436 ,,
South Australia	279 ,,
Tasmania	823 ,,
Western Australia	Nil ,,
Total	38,138 tons

Of the above total 78.47 per cent. was shipped on a consignment basis, the balance, 21.53 per cent., being sold f.o.b. Australia or c.i.f. London.

The exports to other countries for the season were—

To—	
Eastern Ports	4,783 tons
Canada	214 ,,
U.S.A.	23 ,,
Panama	304 ,,
Colombo and India	239 ,,
Port Said	322 ,,
Mauritius	45 ,,
South Africa	137 ,,
Dunkirk	50 ,,
Hamburg	1 ,,
Antwerp	36 ,,
Various ports	14 ,,
Total	6,168 tons

The total oversea exports for the past five seasons were—

1923-24	29,215 tons
1924-25	63,937 ,,
1925-26	43,405 ,,
1926-27	34,004 ,,
1927-28	44,306 ,,

Cheese.—The exports of cheese to the United Kingdom from the various States were—

Queensland	3,038 tons
Victoria	45 ,,
New South Wales	Under 1 ton
Total	3,983 tons

The above was all shipped on a consignment basis, and shows an increase on the previous season of 94.76 per cent.

The exports of cheese to other countries were—

Eastern Ports	... ...	192 tons
Colombo and India	... ...	22 ,,
Sundry small shipments to various ports		1 ,,
Total	... ...	215 tons

The total oversea exports of cheese for the past five seasons were—

1923-24	... ...	1,691 tons
1924-25	... ...	5,123 ,,
1925-26	... ...	3,335 ,,
1926-27	... ...	1,768 ,,
1927-28	... ...	3,298 ,,

TUBERCULOSIS IN CATTLE.

Tuberculin Test in U.S.A.

According to Dr. A. E. Wight, chief of the tuberculosis eradication division of the United States Department of Agriculture, a new record in the campaign against bovine tuberculosis was established in June last, when more cattle were tested than in any other month since the work was started in 1917. The tuberculin test was applied to 1,073,988 cattle contained in 94,315 herds, and 20,080 tuberculous animals were removed during the month. In some States the degree of infection was found to be less than 1 per cent., while in others a higher degree was found. The average for the entire United States in June was estimated to be about 2 per cent.

The report states that, during the twelve months ended 30th June, 1928, the test was applied to 10,826,280 cattle, exclusive of those tested for interstate shipment. When these are added, the total for the year is approximately 11,300,000 head, or about 1,600,000 more than in the previous twelve months.

The per cent. of reactors during the last twelve months was 2.4 as compared with 2.9 per cent. for the year previous.

SWEDISH "EAT MORE FRUIT" ADVERTISING CAMPAIGN.

An American consular report from Stockholm, Sweden, states that several weeks ago there was formed in Stockholm an organization known as "At Mer Frukt" (or "Eat More Fruit") for the purpose of conducting an advertising campaign throughout Sweden with a view to increasing the consumption of fresh fruits on the part of the average person.

According to present plans, the campaign will start with the next fruit-shipping season. The advertising has been placed with one of the largest Swedish agencies, who recently sent a representative to England to study the methods employed in the British "Eat More Fruit" campaign which has proved so successful over the past few years. It is reported that the agency is preparing a booklet containing testimonials from prominent physicians and dieticians endorsing the eating of fresh fruit. These booklets are to be sent to all Swedish newspapers and periodicals for use as general reading matter.

Swedish fruit importers have already taken up with United States connexions the securing of voluntary contributions for the campaign. It is felt that the advertising will result in a marked increase in the consumption of fresh fruit from the United States, particularly apples and oranges, and Swedish fruit handlers believe that United States' growers and shippers, as well as exporters, should stand part of the campaign expense. While efforts to date have been confined to soliciting voluntary contributions, consideration has been given to working out some plan by which United States exporters would pay a small sum on each unit of fruit shipped to Sweden.

The only organization conducting any fruit-advertising campaign in Sweden in the past has been interested in bananas, and has advertised in daily papers, distributed posters to retailers, furnished window displays, &c. Due to intensive sales methods and advertising, a large business in bananas has been developed in a comparatively short time.

It is reported that the new association has a membership of over 7,000, and that a total of 48,000 crowns (approximately 13,000 dollars) had been received in dues and donations. Larger concerns have paid in all the way from 100 to 1,000 crowns, while retailers have contributed 5 crowns or more. Contributions are being received at "Foreningen At Mer Frukt, Lilla Nygatan 28, Stockholm, Sweden." (The Swedish crown is equivalent to about 1s. 2d.)

Official United States export statistics show that in 1927 there were shipped to Sweden 209,000 boxes and 94,000 barrels of apples, while in the preceding four years (1923 to 1926) such shipments varied from 114,000 to 211,000 boxes and 37,000 to 94,000 barrels of apples a year. A study of the Swedish import statistics indicates that around 85 per cent. of total Swedish apple imports originate in the United States, with 60 per cent. arriving by direct shipment, and remainder (25 per cent.) by transhipment from Great Britain, Germany, and Denmark.

WHY PACK GOOD APPLES IN WEATHER-BEATEN BOXES?

Word comes from the export trade that the field-stained boxes used by some apple-packers are causing complaints and injuring the market, not only for fruit in such boxes, but for California apples in general.

The California Standard Apple Act, while it stipulates clean boxes for "Extra Fancy" grade, only requires that containers be "virtually clean" for the "Fancy" grade, which is interpreted to exclude boxes showing dirt, but permits the use of weather- or field-stained boxes. There are no restrictions for soiled boxes in "C" grade and "Unclassified" grade. It is impossible for inspectors to prohibit the use of such containers, except when it conflicts with the law.

The lowering of the restrictions on stained boxes is another instance where the "Fancy" grade has been lowered in the last few years. This grade probably is the principal one affecting the export business, though instances have been known where even "Unclassified" apples have been shipped to foreign markets. "Unclassified" is the lowest grade of apples allowed by law to be offered for sale anywhere. Furthermore, "Unclassified" apples may be packed in containers showing any degree of dirt.

When the majority of California apple growers are shipping good quality fruit in clean boxes it seems unfortunate that some persist in exporting any grade of fruit in unsightly, stained boxes. Many of these containers are badly blackened by long exposure to the weather, and it is hard to estimate the damage which even a few lots of such stock may do to the reputation of our apples.

California is particularly fortunate in having an adequate supply of clean white pine box shook. As a result, our products always show up advantageously in comparison with those of competing sections of the United States which often are packed in less attractive containers made of darker woods. To allow our boxes to become stained and weather-beaten is to throw away this natural advantage.

Since the inspectors at present are not empowered by law to reject stained containers it is suggested that buyers specify in their orders just what grade and size of fruit they want and that boxes be new and clean. This can be made known to the inspector, who will then report such conditions on his certificate.—*Monthly Bulletin* of the Department of Agriculture, State of California.

PRICKLY PEAR.

A Hardy Specimen.

The illustration of the specimen of prickly pear below will give some idea of the hardiness of this plant. When photographed the specimen had been hanging on the wall of the State School at Tanck's Corner, near Diamond Creek, for sixteen months, and was still quite

vigorous. The two long shoots in the photograph grew after the specimen had been hung in the school.

The photograph was kindly supplied by Mr. Jas. M. Sexton, Head Teacher of the school.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux or lime sulphur spraying for the black spot of apples and pears, for scab and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a weak lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codling Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of

this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead. Even a dry dusting with lime or with ordinary soil will keep the slugs in check.

For cherry aphis, the trees should be sprayed at once with nicotine-sulphate.

Codling moth spraying, too, will be in evidence this month. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codling moth, nothing having been found to supersede it.

Arsenate of lead may be mixed with nicotine sprays, or with Bordeaux mixture, without any detriment to either spray, if necessary.

The Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to 1½ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Journal of Agriculture*, November, 1923, page 659. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will. Provide salt-lick consisting of 20 lbs. bone meal, 20 lbs. slacked lime, 20 lbs. salt, and ½ lb. sulphate of iron.

Pigs.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal per 100 lbs. live weight in food daily. Give plenty of charcoal. If pigs are lousy, dress them with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Prepare for dipping. Ascertain exact contents of bath before mixing.

The worried existence led by sheep which are constantly tormented by ticks and lice reacts on and seriously depreciates the quality of the wool and the condition of the sheep, and especially of lambs. If sheep are found to be ticky or lousy they should be dipped immediately, so as to relieve without delay the irritation caused by vermin. In cases where lice are very bad it will be necessary to dip young sheep twice to free them from the pest. Irritation soon causes the sheep to become restless and to scratch against posts and logs, thereby making them fail in condition and causing loss by the tearing of their fleece. Dipping, if the proper materials are used, and the work is properly carried out, is one of the most valuable investments that any owner of sheep can make. It gives returns which more than compensate for the trouble and expense incurred. When a sheep-owner becomes accustomed to using a certain dip as effectively as he should, it is then that he appreciates the results most.

Dipping does not make the wool grow where none grew before, but it keeps the skin healthy, and so enables it to grow a healthy wool. If a sheep's life be spent in feeding and sleeping, it will naturally grow a better fleece than if it has to spend time in scratching and biting, and thus losing part of the wool it has already grown. An important factor in some dipping is to keep the liquid in the dip in motion by constant stirring, as, if it is allowed to settle, the light insoluble matter floats on the top of the water, and may be the means of poisoning sheep if taken by them when passing through the dip. Valuable sheep have been poisoned in this way. Whatever brand of dip is used, the instructions accompanying it should be faithfully followed.

Lambs should not be put through the dip when thirsty, as they may drink as they swim through. For the same reason they should be kept away from any small pools in the vicinity of the exit from the draining pens. Sheep just dipped should not be put on to grass before they have dried, as the drip of the bath on the grass may cause poisoning.

Never allow the rams to join the ewes after dipping until the ewes have dried, and the same applies to the lambs and their mothers. Never hurry sheep through a dip; some cannot swim as fast as others; give them plenty of time, they can swim a fair distance in one minute, which after all is not long to wait. Their heads should be pushed under two or three times, but on no account held under. Care must be taken to see that the animal is thoroughly saturated to the very skin. Remember that the dip has to contend against the greasy nature of the fleece and skin and must be allowed time to do this. So many dipping operations fail on account of insufficient immersion, often due to the hardness of the water. Always be careful to dip every sheep, because a few undipped infested ones may reinfest the dipped sheep. It is important that sheep in the one district should be dipped about the same time, so as to avoid chances of reinfestation.

Poultry.—Provide plenty of green food and shade. Watch for vermin; spray crevices of perches and houses with crude carbolic acid, 1 in 50. Keep water clean and cool, and out of the sun. One packet of Epsom salts should be given to thirty birds through the mash. Remove all male birds from the flock. Infertile eggs are preferable when pickling, or when placed in cool storage.

CULTIVATION.

Farm.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

Orchard.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, cherry aphis, pear and cherry slug, and peach aphis. Plant out citrus trees.

Vegetable Garden.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow French beans, peas, lettuce, cucumber, melon, &c., seeds.

Flower Garden.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out chrysanthemums. Liquid-manure herbaceous perennials. Sulphur-dust for rose mildew.

VITICULTURE.

Vineyard.—Field grafts require careful attention in the way of removal of suckers and scion roots. (See Bulletin on "Spring Grafting," No. 38, page 29.) Keep a sharp look out for Black Spot and Downy Mildew; whether the latter disease is seen or not, finish spraying by 20th October. A preliminary spray when the bunches are most visible is strongly recommended. In irrigated vineyards make it a rule to *spray immediately before watering.* Information on Black Spot and Mildew will be posted on application. Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping and topping. Avoid excessive topping; summer pruning is often more injurious than useful in warm, dry climates. Young vines especially need judicious handling. Disbudding and stopping, though not indispensable, are of great use to shape the vine. Early execution is imperative. *Better not disbud at all than disbud late.* Cincture Zante currant vines after flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Taste all young wines; beware of dangerous symptoms in unfortified fruity wines, which may need treatment. Fill up regularly all unfortified wines.

BEE-KEEPING.

In most districts, October is the principal swarming month; in late localities, particularly at the higher elevations, most of the swarming takes place in November. Where a honey flow is expected from Redgum or Yellow Box during December and January, it is not wise to make a further increase in the number of colonies by allowing after-swarms to come off and hiving separately, as the parent stock would be too much depleted of bees, and there would not be sufficient time for it to recover, or for the swarms to build up, before the honey flow is on, and much of it would therefore be lost.

After-swarms can best be prevented by hiving the first or prime swarm on the old stand and moving the colony from which it came to a new stand, at the same time destroying all the queen cells in it except one—the most perfect and forward one.

If no increase at all is desired, the parent colony may be left alongside the old stand on which the swarm was hived, but with the entrance facing in a different direction. When the young queen in the swarmed stock is laying, which will be in about three weeks, the hive may be gradually turned round till it faces the same way as the swarm, and, after removing the old queen from the swarm, the two stocks may be re-united, thus making a very strong colony with a young laying queen, in the best condition for storing honey and very unlikely to swarm again the same season.

The uniting of the two stocks is best done towards evening, by first giving both a little smoke between the combs and then alternating them for the time being, so that each comb from the swarm is between two of the old combs, the object being to thoroughly mix the bees. Two or three days after, the combs can be sorted; the best should be selected for the brood chamber and the others put in the upper story. Uniting should not be attempted until the young queen has been laying for at least seven days, otherwise there will be much fighting.

In localities where the colonies have come through the Winter very strong, there is likely to be much swarming wherever Cape Weed or some other pollen-yielding plant is plentiful, the duration of blooming and of swarming depending, of course, upon the weather.

When several days of bad weather follow the hiving of swarms, it may be advisable to feed sugar syrup (one part sugar to one part water) to keep up comb-building and brood-rearing, so as to have the greatest number possible of field bees in the hive during the honey flow later on. Honey should never be used for feeding bees, unless it comes from an apiary which has been absolutely free from disease for at least two years.

SOMNER'S TIP TOP SEEDS

SUMMER FODDERS

The Best and Cleanest Seed in Victoria

FOR SPRING SOWING

SUDAN GRASS

Sow 7 lbs. per acre in drills; 20 lbs. broadcast. **6d.** lb.; **50/-** cwt.

SACCALINE

(Sweet Sorghum)

Sow 15 to 25 lbs. per acre broadcast, or 7 lbs. in drills. **6d.** lb.; **50/-** cwt.

IMPHEE

(Planter's Friend)

Sow 12 lbs. per acre in drills; 18 to 20 lbs. broadcast. **7d.** lb.; **56/-** cwt.

JAPANESE MILLET

Sow 10 lbs. per acre in drills; 20 lbs. broadcast. **2d.** lb.; **17/6** cwt.; **£16** ton in ¼ ton lots or more.

SORGHUM SACCHARATUM

Sow 14 lbs. per acre broadcast, or 7 lbs. in drills; **7d.** lb.; **56/-** cwt.

Early Ambercane

Sow 7 lbs. per acre in drills; 14 lbs. broadcast. **7d.** lb.; **56/-** cwt.

LUCERNE

(Sow 8 to 10 lbs. per acre in drills, or 20 lbs. broadcast)

HUNTER RIVER ("Pilca-Butta" Strain), 3/- lb.; **2/10** lb. in cwt. lots or more. **Ordinary Machine-cleaned** (guaranteed broad leaf N.S.W. grown), **2/10** lb.; **2/9** lb. in cwt. lots or more.

FRENCH PROVENCE (True), 2/3 lb.; **2/-** lb. in ½ cwt. lots or more.

NEW ZEALAND (Celebrated Marlborough Strain), 2/4 lb.; 2/3 lb. in cwt. lots or more.

RAPE

(Sow 4 to 6 lbs. per acre in drills; 8 to 12 lbs. broadcast)

Somner's "Tip-Top" True Giant Kangaroo Rape (We are the original introducers)—**10d.** lb.; **84/-** cwt.

Dwarf Essex—Imported English (true) **8d.** lb.; **65/4** cwt.; Imported Dutch, **7d.** lb.; **60/-** cwt.; New Zealand, **7d.** lb.; **60/-** cwt.

White Mustard—Sow with Rape at the rate of 1 to 2 lbs. per acre, as it prevents blowing. **1/6** lb.; **150/-** cwt.

Sheep's Parsley—**2/6** lb.

LAW, SOMNER Pty. Ltd.

Established over 78 Years

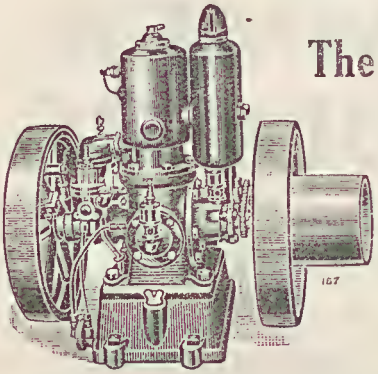
Seed Merchants and Nurserymen

Block Place & Swanston St., Melbourne, C.1

The leading Agricultural Seed House in Victoria

Economical Power
and Two Powerful Pumps

ALL MADE IN AUSTRALIA



The Wallaby Petrol Engine

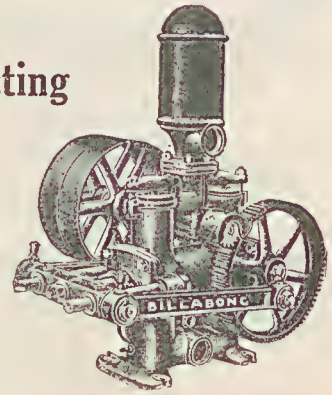
The very Engine for the Farm

The WALLABY, running on a fuel consumption of approximately ½ to ¾ pint per B.H.P., is an efficient and cheap source of power for use on the Farm. If you would lighten your work, learn all about the WALLABY. Full particulars and Prices on request.

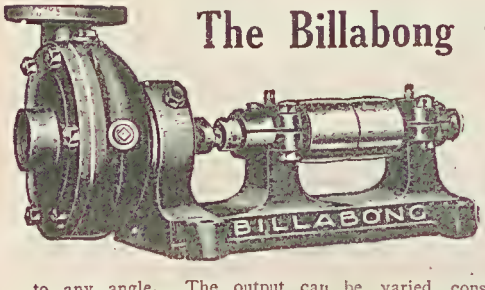
The Billabong Double-Acting Piston Pump

The BILLABONG combines ample power and large capacity in most compact form. The Base, Cylinder, Gearings, and one Cylinder Head are cast in one piece—ensuring the alignment of Gearing and giving an unusually rigid construction.

It is specially adapted to meet the demand for a medium-priced power pump to be operated by kerosene or petrol engines or other belt power.



The Billabong Centrifugal Pump



The BILLABONG CENTRIFUGAL is typical of the quality and efficiency of all pumps made under our name. It is the best type of pump for raising large quantities of water for irrigation and other purposes, and has a greater capacity, size for size, than any other style. Large waterways are provided, and the casing may be turned so that the suction and delivery may be adjusted to any angle. The output can be varied considerably without loss of efficiency. For full particulars of these and other Pumps, send for our General Pump Catalogue

JOHN DANKS & SON Pty. Ltd.

391-403 Bourke Street - Melbourne
324-330 Pitt Street - - - Sydney

Makers of Windmills, Pumps, Troughing, &c.

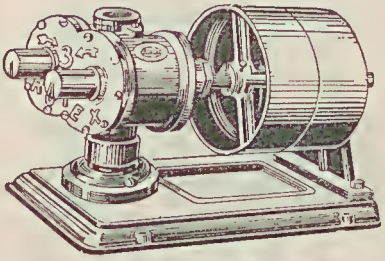
It's Yours - *Send for your copy* TODAY !

If you are using, or intend to use, Pumping appliances of any kind you should secure a copy of "Profitable Pumping"

Injudicious purchasing of Pumps may result in getting one that is really not suitable for the work to be done. The inevitable consequences are :—loss of time, loss of profits, loss of efficiency generally, or needlessly heavy running costs. "Profitable Pumping" will help you to select the right Pump. It is packed full of information and facts about Pumps and Piping, and has many illustrations and useful tables. A copy will be sent POST FREE without any obligation whatever, to all users of the coupon below. SEND IT NOW.

Here is one of our useful Pumps:

"ROTEX" LIFT & FORCE PUMP



The "ROTEX" is a Rotary Force Pump designed for use wherever water or other liquid must be rapidly elevated by power. Particularly useful for discharging into an elevated tank, also as a fire pump for use about factories, warehouses, &c. Will draw water against a suction lift of 25 ft. (using foot valve) and force it against an approximate head of 60 ft.

No.	Capacity per hour.	Price.
1	1,200 gallons ..	£6 10 0
3	1,800 gallons ..	£8 10 0
4	3,000 gallons ..	£13 10 0
6	4,200 gallons ..	£26 0 0

McPherson's
Proprietary Limited

582-592 Collins St. - MELBOURNE

Send this coupon NOW !

Please send me, Post Free, a copy of "Profitable Pumping"

Name .....

Address .....

Brighten your Home—ELECTRICALLY

HAVE abundant light to work by, to read by, and to play by! Flood the room with brilliance at the touch of a handy switch! No more straining the eyes in a dim kerosene light, no fussing with a gas plant, no danger from fire!

Every country home nowadays can enjoy electric light, for

DELCO-LIGHT

ELECTRIC—PLANTS

are very reasonably priced

No other plant is so simple, so highly efficient, so perfectly free from trouble of any kind. Delco-Light is powerful, too, supplying sufficient electricity not only for lighting, but also for operating an electric iron, vacuum cleaner, Frigidaire electric refrigerator, and small motors for driving a chaff-cutter, separator, churn, and other appliances. There are models to suit every requirement. Let us send you full details—write or call. EASY TERMS ARRANGED.

WARBURTON FRANKI Ltd.

380-382 Bourke Street - - MELBOURNE
307-311 Kent Street - - - - SYDNEY
233-235 Elizabeth Street - - - BRISBANE

DEPARTMENT OF AGRICULTURE

GOVERNMENT COOL STORES

VICTORIA DOCK

Facilities are provided for producers and smaller exporters of the various kinds of produce, so that direct shipments on their own account may be undertaken. The Government ownership and conduct of Cool Stores places producers in an independent position, and, in addition, preserves an open channel for the carrying on of the export trade in perishable products.

The Department of Agriculture will receive, handle, freeze, store, and ship **Butter, Cheese, Eggs, Fruit, Meat, Poultry, Rabbits and Hares, &c.,** for producers and exporters.

Produce to the value of over **£30,000,000** has been treated at the **Government Cool Stores.**

GOVERNMENT COOL STORES, VICTORIA DOCK (Dudley St.)

Telephones:

Office: 10383 Central. **Superintendent and Engineer-in-Charge: 10382 Central.**

SCALE OF CHARGES, ETC.

and further particulars may be obtained upon application to the

EXPORTS SUPERINTENDENT, DEPARTMENT OF AGRICULTURE,
PRODUCE OFFICES, 605-7 FLINDERS STREET, MELBOURNE.

Telephone, 9380 Central.

FRUIT TREES—Plant Now!

Best assorted healthy grown Fruit Trees, 13/- doz., 90/- per 100; Grape Vines, Passion Vines, Rhubarb Roots, Gooseberries, Currants, best sorts, 4/- doz.; Oranges, Lemons, Persimmons, Mulberries, 3/- each; Loganberries, 4/- doz.; Raspberries, 1/3 doz., 7/- 100; Strawberries, 9d. doz., 2/6 100; Cypress and Gums in pots, packed free, 3/6 doz., 55/- 100; Assorted Wattles, 10/- doz., 70/- per 100; Pinus Insignus, open ground, 4/- doz., 25/- 100; Large Leaf and Golden Privet, 2/- doz., 14/- 100; Green, 1/6 doz., 10/- 100; Roses, choice varieties, 1/- each, 11/- doz.; Boobyalla quick-growing Evergreen, 7/- doz.; Lovely Green Veronica Hedges, Rosemary, Golden Variegated Privet, 4/6 doz.; Elms, Oaks, Large Leaf Planes, Chestnuts, Laburnums, 2/- each; Willows and Poplars, 1/6 each; Double-Flowering Peaches, Plums, Apples, Apricots, Quinces, Hawthorns, 2/-; Filbert and Monkey Nuts, 1/- each; Best Cherry Plums, 7/- doz., 50/- 100; Herbs, 3/- doz. roots; Chrysanthemums, Dahlias, Carnations, Gladioli make a wonderful show, good mixed, 5/- doz.; named, 8/- doz.; Kikuyu Grass, wonderful for poor and dry soils, good fodder, and excellent for lawns, 5/- 100 roots.

'Phone 1, Avonsleigh. **Write for full price list.**

A. G. NIGHTINGALE, Nurseryman, Emerald, Vic.

MADE IN AUSTRALIA

J. M. & Co. TRADE MARK

Ask for

ANCHOR BRAND

DOUBLE REELED

Binder Twines

THE ABSOLUTE BEST

Manufactured by

James Miller & Co. Propty. Ltd.

357-359 Little Collins Street, Melbourne

WORKS—YARRAVILLE. BRUNSWICK

ANCHOR BRAND BAGGING TWINES

ARE ALSO THE BEST ON THE MARKET

Sold by Merchants, Storekeepers, and Agents

LILYDALE LIME For the LAND

Farmers who have not used **Burnt Lime** should try it. The action of Burnt Lime on the land is **Immediate.** Farmers have the opportunity of obtaining the **well-known Lilydale Agricultural Lime.**

ANALYSIS—98% Calcium Oxide.

Apply—

DAVID MITCHELL ESTATE,

Sole Proprietors.

Head Office:

OLIVER'S LANE, MELBOURNE

Tel. Central 5725 and 5726.

THE STATE SAVINGS BANK OF VICTORIA

"The People's Bank"

LOANS TO FARMERS

In sums from £50 to £3,000 up to **three-fourths** of valuation.

INTEREST: Loans not exceeding £1,000, 6 per cent., repayable by instalments over 30 years; Loans exceeding £1,000, 6½ per cent., repayable by instalments over 31½ years

SPECIAL TERMS TO RETURNED SOLDIERS

No Charge for Mortgage Deed

For particulars, call on your local Branch Manager or write direct to Head Office.

Head Office:
139-153 Elizabeth Street, Melbourne.

GEO. E. EMERY,
General Manager.

DEPARTMENT OF AGRICULTURE

POULTRY FOR SETTLERS

Orders for Cockerels for delivery from March may now be booked from the Poultry Pens at the Central Research Farm, Werribee
Settings of Eggs can be supplied in season
1st July to 1st October orders are booked in rotation

WHITE LEGHORNS

No. 1—Pure Cosh World's Record Strain.

„ 2—From Single Tested Hens with scores of 260 to 285 eggs, Single Mated to Cocks bred from Hens with scores of 275 to 301 eggs.

UTILITY BLACK ORPINGTONS

(Founded on Christie and Cullen Strains)

No. 1—From Single Tested Hens with scores of 256 to 284 mated to Cockerels bred from Hens with scores of 272 to 313 eggs.

„ 2—From Hens bred from above mated to Cockerels bred from Single Matings.

For prices and particulars apply to The Manager, Research Farm, Werribee

Ask for them by Name

YATES' Reliable Seeds are known and grown by an ever-increasing proportion of the gardening and farming population of Australia.

Whether you are a Dairy Farmer, Grazier, Market Gardener, Flower Grower, or a Home Garden man, we can serve you.

In all the important Victorian towns, as well as throughout the Commonwealth, one or more of the leading stores carries stocks of our Sealed and Dated Packets in all the popular varieties of flower and vegetable seeds. These stores will be pleased also to obtain for you agricultural seeds and the other lines we offer.

In addition, we operate a Mail Order Dept. covering all Farmers' and Gardeners' requirements. Write us now for our Farm and Garden Seed Catalogues and the names of dealers in your district.

ARTHUR YATES & Co. Ltd.
P.O. Box 2707c - - SYDNEY

Yates' Reliable Seeds

By Authority: H. J. Green, Government Printer, Melbourne

DEPARTMENT OF AGRICULTURE

STATE FARM, RUTHERGLEN

Border Leicester RAMS

There are available for sale a number of Pure-bred Border Leicester Rams at the following prices :—

Flock Rams	- -	**6-7 guineas**
„ „	**(selected)**	**8-10 „**
Stud Rams	- -	**12-20 „**

Delivery to be taken by 1st December, 1928

The flock is registered as No. 97 in the Flock Book of the A.S.B.B.S., and may be inspected by appointment

Applications should be made to

The Manager, STATE FARM, RUTHERGLEN

S. S. CAMERON - - Director of Agriculture

£6-15-0

Buys the Finest Holiday in Australia

A WEEK AT

MT. BUFFALO

National Park

Return 1st Class Rail and Motor Fares from Melbourne, Meals *en route*, and Accommodation at The Chalet, are covered by the all-inclusive ticket obtainable at the

Sp
630-5
V645

GOVERNMENT TOURIST BUREAU

QUEEN'S WALK —— MELBOURNE

'Phone C. 2896